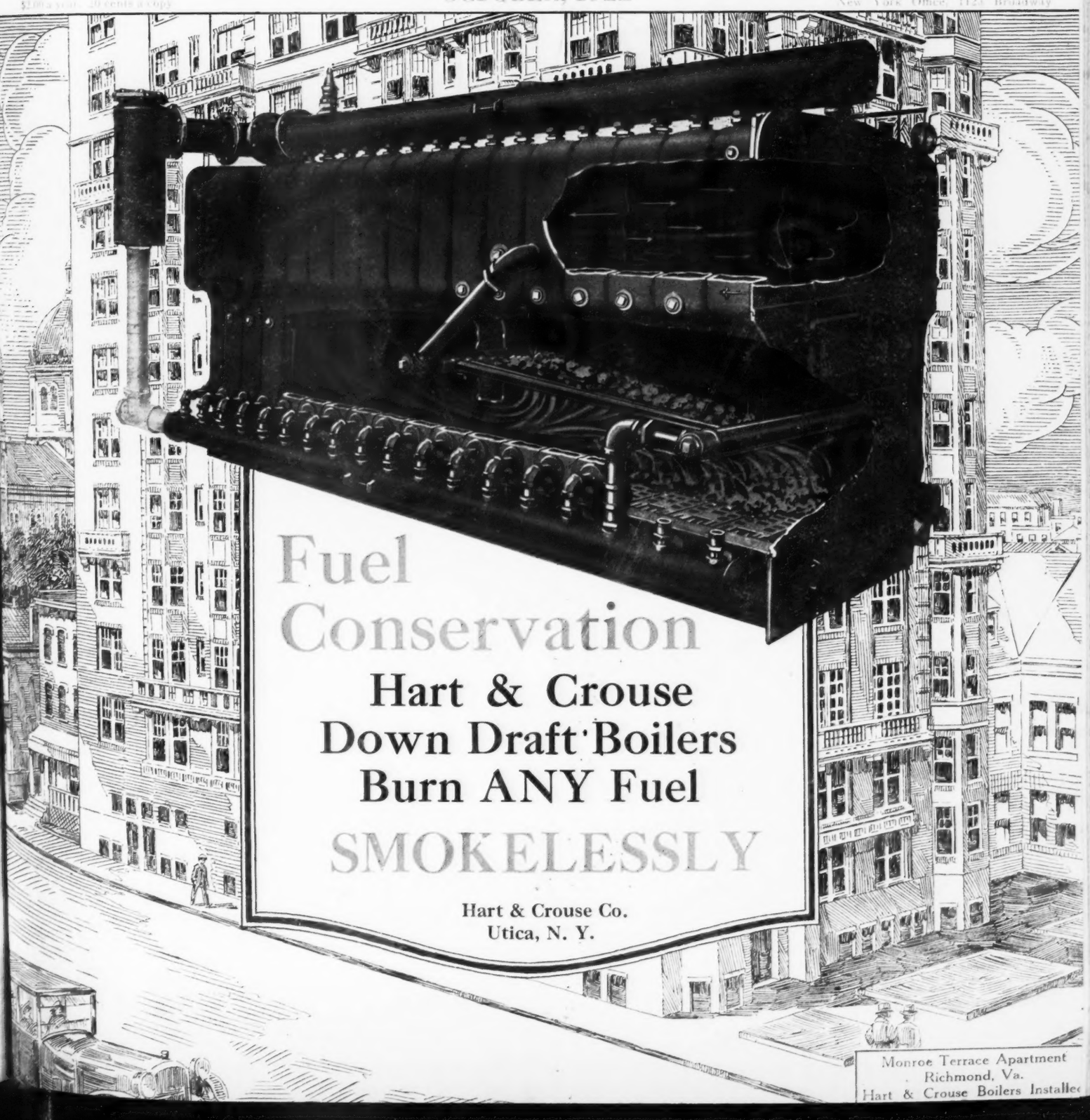
The Heating and Ventilating Magazine

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

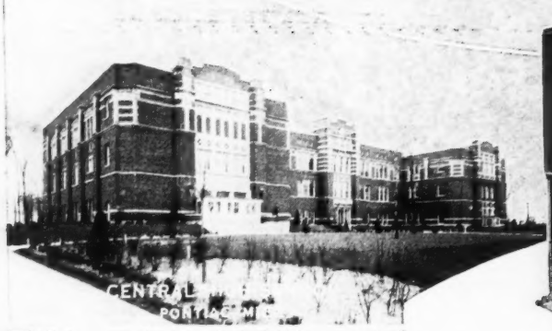
Vol. XIX No. 10 — OCTOBER, 1922 — Published at Cooperstown, N. Y.

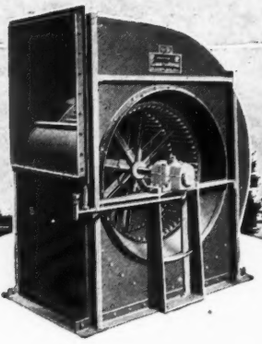
$2.00 a year. 20 cents a copy. — New York Office, 1123 Broadway



Schools Equipped with

CLARAGE — KALAMAZOO Multiblade Fans

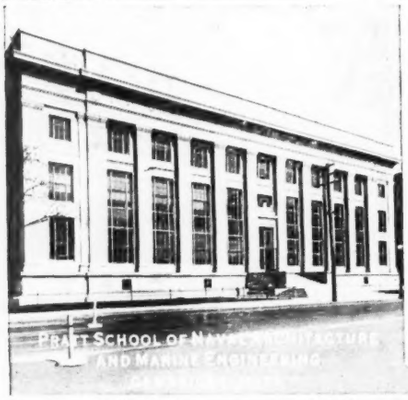




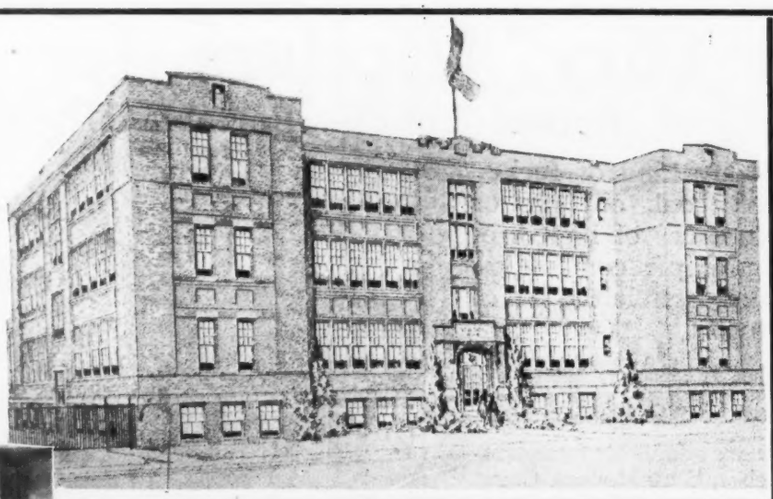
AN EVER INCREASING number of leading architects are specifying Clarage Kalamazoo Multiblade Fans, for the simple reason that they have found the product unusually reliable and the service prompt and courteous.

CATALOG Number Fifty-two describing the Multiblade Fans will come to you at your request.

CLARAGE FAN COMPANY
Branch Offices in All Principal Cities
***Main Office and Factory,* KALAMAZOO, MICH.**



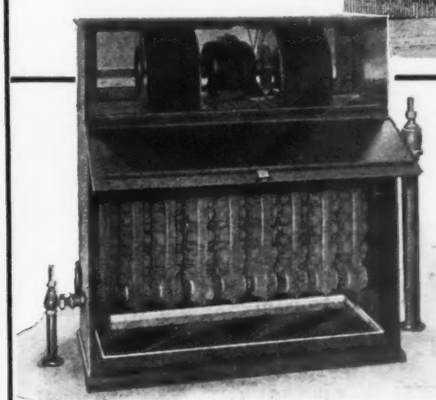
The Peerless unit is a mechanical gem. Has a radiator of the vento type, noted for efficiency; ball bearing motor requiring little attention; fan wheels of aluminum, perfect in design and balance; and a mixing damper without a peer.



Hamilton School Harrison, N. J.

Equipped with seventeen Peerless Units

Joseph W. Baker Architect



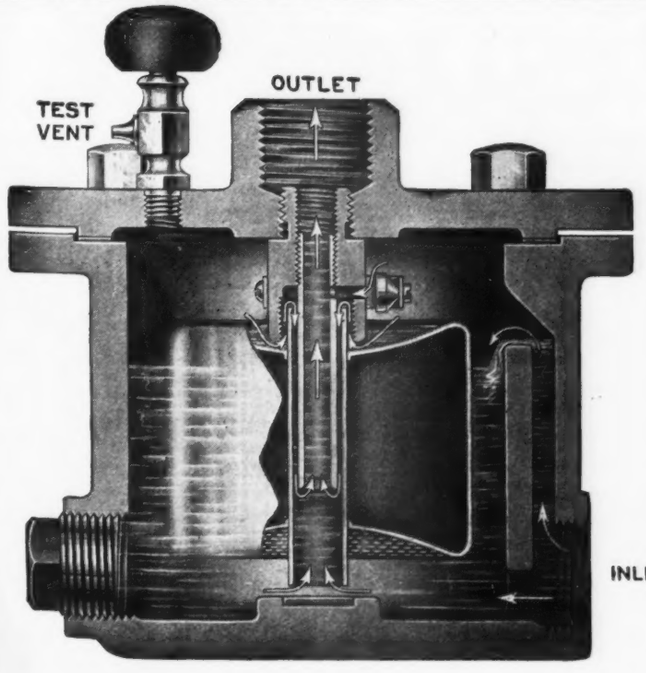
Peerless Unit with front door open showing fans and motor. Front panel and baffle removed, showing special Peerless Vento radiation and humidifying pan.

Service, Efficiency and Economy

Here is a heating and ventilating unit that combines service with efficiency and produces economy. Service in supplying pure fresh air to the required amount with perfect distribution and at the right temperature. Efficiency in the operation of the Peerless mixing damper that will by pass all or any portion of air around the radiator and economy in installation cost and the saving of fuel.

Familiarize yourself with this Peerless Unit by sending for our catalog.

PEERLESS UNIT VENTILATION CO.
437 West 16 St. New York City



MARSH

DUPLEX WATER SEAL LOW PRESSURE

BLAST TRAP

for direct or indirect coils or any location where large quantities of water are to be discharged

Operates automatically either with or without mechanical suction on return line.

No complicated parts to stick or get out of order.

No small openings to clog up with sediment or scale.

Free passage of water—rapid and steady vent of air and passes no steam.

Combined action of flotation for water and all metal thermostatic vent for air together with relief of air through water seal makes the ideal trap for heavy service.

Adjusted and tested at factory and shipped ready for installation, to work automatically from below atmosphere on up to 25 pounds steam pressure.

We Invite Correspondence

JAS. P. MARSH & CO., 118-124 South Clinton Street, Chicago

FOUNDED 1865

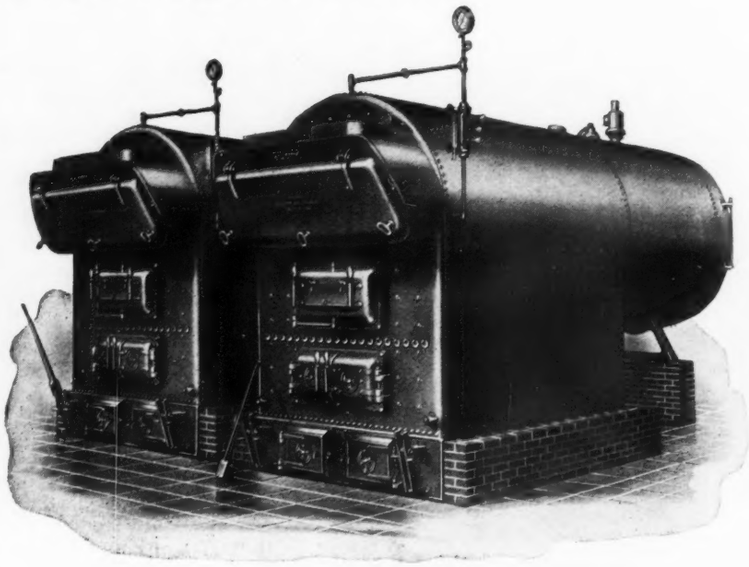
Manufacturers of Radiator Traps and Specialties—Automatic Air Valves and Vents Indicating and Recording Gauges

Agents for Great Britain and Ireland: Chatterton & Co., 30 Fetter Lane, E. C. 4, London
Agents for Dominion of Canada: Taylor-Forbes Co., Ltd., Guelph, Ontario

"Oil City" Boilers for Heating

Return Tubular Portable Firebox

Will burn any kind of fuel,—hard or soft coal, oil, gas or lignite. Note use of high firebox, giving ample combustion area to make possible the use of low-grade fuels.



Why "Oil City" Boilers are Ideal for Heating Work:

These boilers are adaptable for Apartments, Churches, Club Houses, Court Houses, Hospitals, Garages, Hotels, Office Buildings, Large Residences, Post Offices, Schools, etc., because they are Safe, Efficient, Dependable, and, being Self Contained, require little attention.

Circular H-5, H-7, H-12, H-13, gives Full Specifications, Ratings and Weights.

Built of Steel, in Accordance with the A. S. M. E. Code

OIL CITY BOILER WORKS, OIL CITY, PA.

BRANCH OFFICES

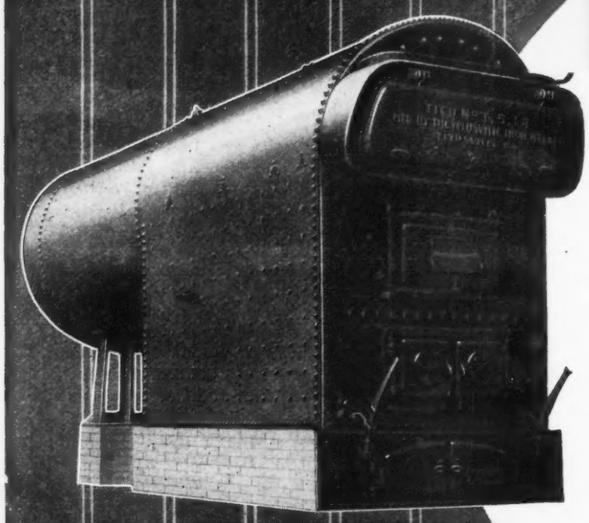
NEW YORK, 501 Fifth Ave. CHICAGO, No. 1224 Marquette Building PITTSBURGH, House Building

REPRESENTATIVES

CLEVELAND, OHIO PHILADELPHIA, PA. ATLANTA, GA. SEATTLE, WASH. BALTIMORE, MD.
SAN FRANCISCO, CAL. ST. PAUL, MINN. BOSTON, MASS. DENVER, COL. HOUSTON, TEXAS

TICO SMOKELESS BOILERS

DOWNDRAFT RETURN TUBULAR



The "TICO" *Smokeless* Downdraft Return Tubular Portable Boilers

are of perfect workmanship and material and will give long, efficient, smokeless service.

Our new catalog No. 81 gives complete details as to design and construction of not only this boiler, but all Tico Boilers.

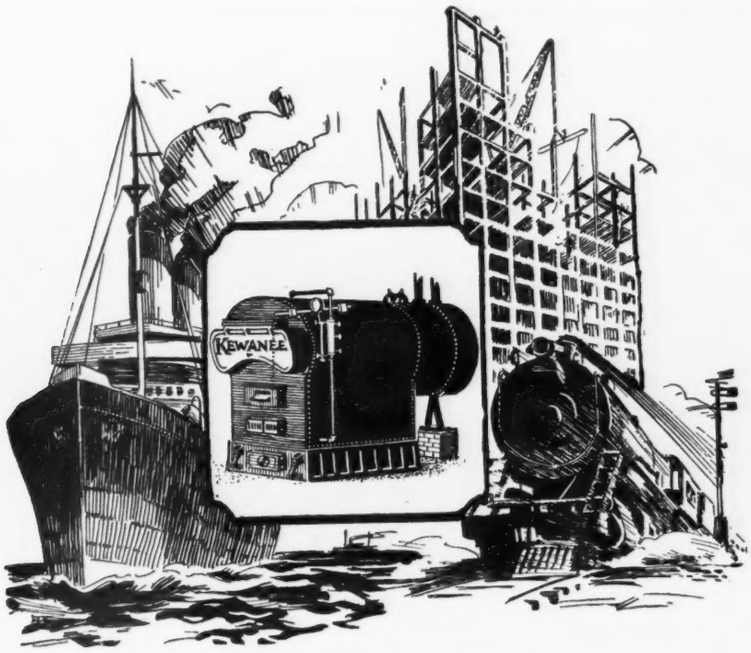
Have you received your copy?

SALES OFFICES

Chicago Office 53 W. Jackson Blvd. Buffalo Office 821-823 Marine Trust Bldg. Pittsburgh Office Farmers Bank Bldg.
New York Office, 152 West 42nd St.

The Titusville Iron Works Co.

Titusville, Pa.



All Built of Steel

Steel! Not plain steel, but *King* Steel—rules in this world of ours—the bulwork of progress—dominant wherever strength and durability are demanded.

That's why Kewanee Boilers are made of it. That and our careful and thoro method of construction has given this boiler a permanent home in the mind of every architect and heating engineer.

KEWANEE BOILER COMPANY

KEWANEE, ILLINOIS

Steel Heating Boilers, Radiators, Tanks, Water Heating Garbage Burners

BRANCHES:

CHICAGO	Market and Washington Sts.	MILWAUKEE	Mer. & Mfrs. Bank Bldg.
NEW YORK	47 W. 42nd St.	PITTSBURGH	945 Oliver Bldg.
DES MOINES	315 Hubbell Bldg.	DENVER	514 Boston Bldg.
KANSAS CITY	2014 Wyandotte St.	DALLAS	Southwestern Life Bldg.
INDIANAPOLIS	509 Occidental Bldg.	DETROIT	1772 Lafayette Bldg.
ST. LOUIS	1212 Chemical Bldg.	TOLEDO	1121 Nicholas Bldg.
MINNEAPOLIS	708 Builders Exchange	CLEVELAND	76 Rose Bldg.
COLUMBUS, O.	808 1st Natl. Bank Bldg.	ATLANTA, GA.	1524-25 Candler Bldg.
SALT LAKE CITY	204 Dooly Bldg.	SAN FRANCISCO	72 Fremont St.

CANADIAN REPRESENTATIVES—The Dominion Radiator Co., Ltd.

Toronto, Ont., Montreal, Que., Winnipeg, Man., Hamilton, Ont., St. John, N. B., Calgary, Alta.

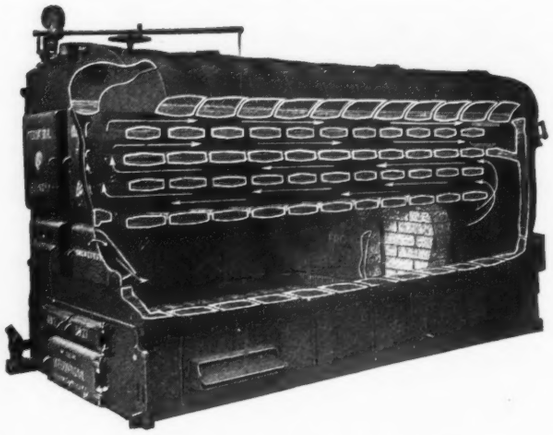
KEWANEE

Why
the Economy Smokeless
does not need an expert fireman

In designing the **Economy Smokeless Boiler,** the makers properly considered the Janitor problem with the result that the **Economy Smokeless** does not require expert attention.

It is a real smokeless boiler with the simplicity of the hard coal boiler, only one grate is used same as in the regular Economy Sectional. It is fired like the general run of flat grate boilers with which all janitors are familiar. It isn't limited to any particular method of firing or to a special grade of coal.

Excess air, while necessary to burn the volatile gases of soft coal, is often the cause of excessive fuel waste. That is why the excess air control is conveniently located in the fire door of the Economy. In a jiffy the janitor can make his adjustment to suit the varying conditions of the fire without the bother



experienced when located on the side or out of way places.

This one feature—*simplicity of operation*—makes the Economy especially adapted to the needs of the janitor and the man who pays the coal bills.

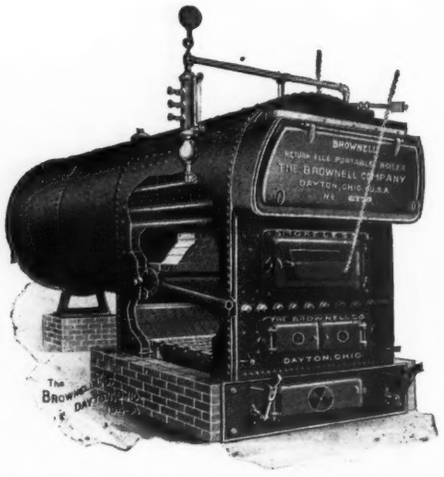
Other distinctive features outlined in Bulletin 1436-H. A copy will be sent to you on request.

INTERNATIONAL HEATER COMPANY, UTICA, N. Y.

BRANCHES: New York Chicago Cleveland, O. Nashua, N. H.

BROWNELL

Do you know—



Brownell Return Flue Portable Boiler—Smokeless Type

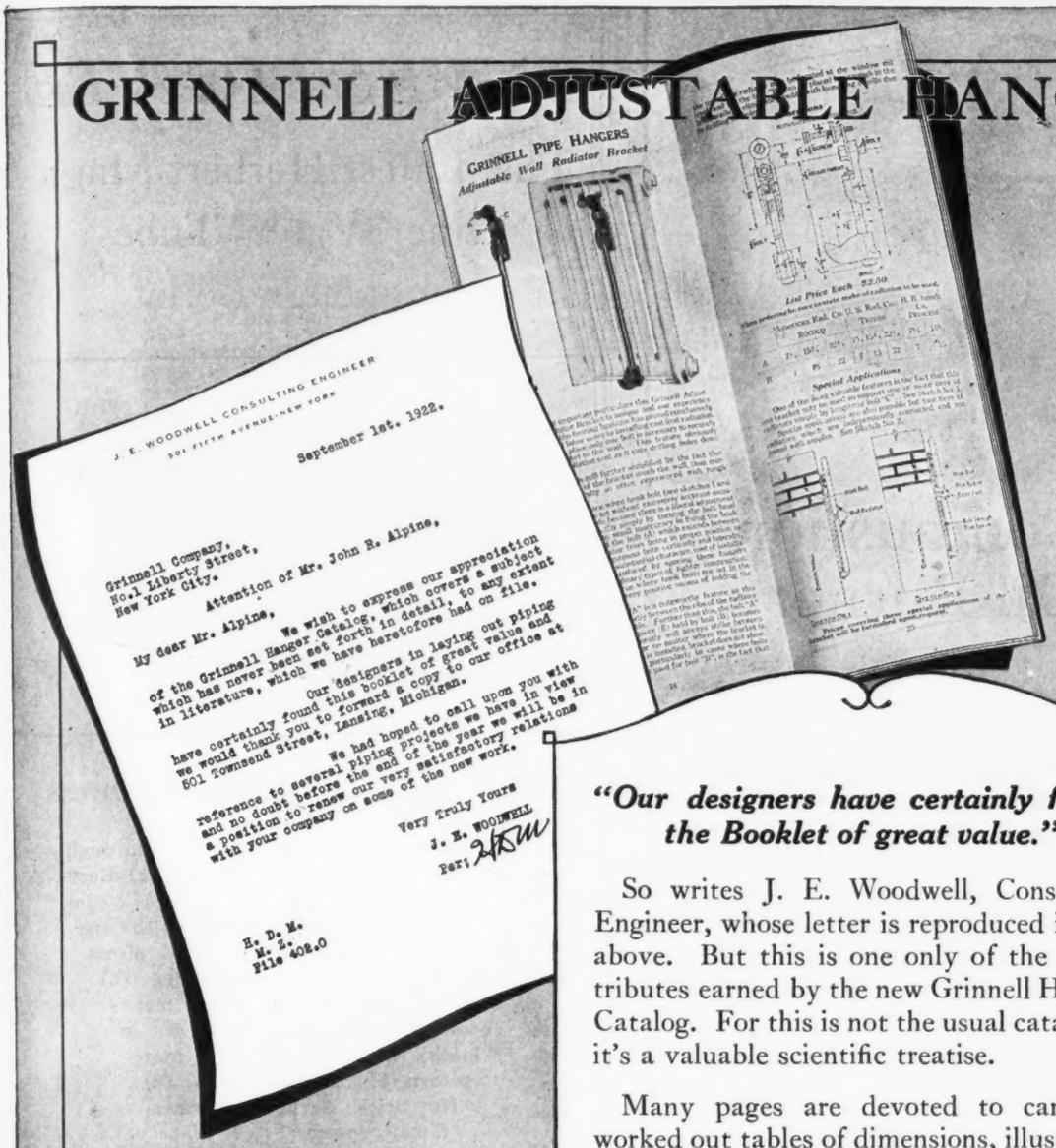
The A. S. M. E. Boiler Code is considered one of the best codes today, but if you should buy an A. S. M. E. Code Boiler are you sure of a satisfactory boiler? ***You are not.*** Boilers can be built according to the A. S. M. E. Boiler Code, or almost any other code for that matter, and still be radically different in design. Perhaps one is good and the other very bad. The Code limits various details, prohibits others, but allows many designs. A great deal is put up to the boiler manufacturer. A Brownell Boiler is backed by 67 years of boiler experience and inspected by one of the oldest inspection and insurance companies. You take no chance in buying a Brownell A. S. M. E. Code boiler. There is a difference. Let our representative show you.

Bulletin B 6-A

THE BROWNELL COMPANY
DAYTON, OHIO, U. S. A.
Established 1855

BOILERS

GRINNELL ADJUSTABLE HANGERS


GRINNELL PIPE HANGERS
Adjustable Wall Radiator Bracket
List Price Each $2.50
Special Applications
J. E. WOODWELL CONSULTING ENGINEER
501 FIFTH AVENUE-NEW YORK
September 1st. 1922.
Grinnell Company,
No.1 Liberty Street,
New York City.
Attention of Mr. John E. Alpine,
My dear Mr. Alpine,
We wish to express our appreciation of the Grinnell Hanger Catalog, which covers a subject which has never been set forth in detail, to any extent in literature, which we have heretofore had on file.
Our designers in laying out piping have certainly found this booklet of great value and we would thank you to forward a copy to our office at 601 Townsend Street, Lansing, Michigan.
We had hoped to call upon you with reference to several piping projects we have in view and no doubt before the end of the year we will be in a position to renew our very satisfactory relations with your company on some of the new work.
Very Truly Yours
J. E. WOODWELL
Per;
E. D. M.
M. Z.
File 402.0

"Our designers have certainly found the Booklet of great value."

So writes J. E. Woodwell, Consulting Engineer, whose letter is reproduced in full above. But this is one only of the many tributes earned by the new Grinnell Hanger Catalog. For this is not the usual catalog—it's a valuable scientific treatise.

Many pages are devoted to carefully worked out tables of dimensions, illustrated by mechanical drawings showing methods of installing pipe equipment. They will save hours of scaling and computing in the preparation of plans and estimates. "—— of great value," they are true words!

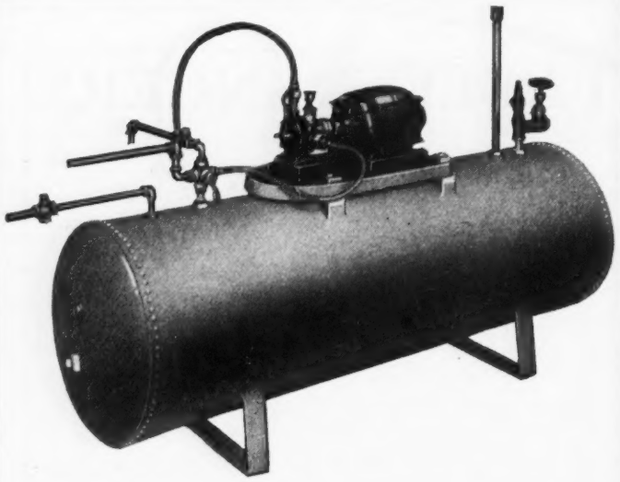
How Many?

Write us and we will gladly send you, free of charge, as many copies of this Hanger Handbook as your staff can use to advantage. Address Grinnell Company, Inc., 292 West Exchange St., Providence, R. I.

GRINNELL COMPANY

Automatic Sprinkler Systems | Steam & Hot Water Heating Equipment | Humidifying and Drying Equipment | Fittings, Hangers and Valves | Pipe Bending, Welding, etc. | Power and Process Piping

If it's Industrial Piping, take it up with us



The Combustion Fuel Oil Burner

As safe and simple as your electric lights

MR. HEATING CONTRACTOR

The Combustion Fuel Oil Burner, which has been sold exclusively through the distributor, will now be sold directly through the heating contractor.

The Combustion Fuel Oil Burner can be installed in any kind or make of heater. The system consists of 5 simple elements —air jet nozzle, pilot light, motor-driven air pump, automatic thermostatic control and fuel tanks. The air jet nozzle is the burner and fires directly into the fire pot by spraying the oil into the flame of the pilot light. The pilot light is a gas flame that ignites the sprayed fuel oil. The pump furnishes a uniform supply of air and oil and the electric power required to run the motor is very slight.

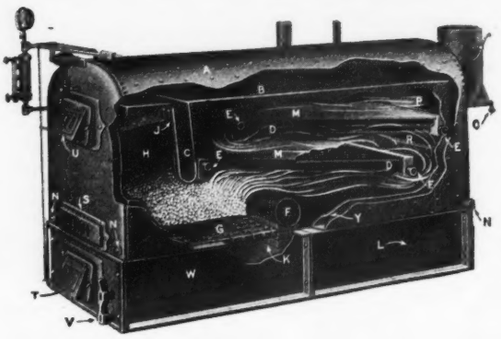
Let us have your inquiry and get in on a tide of new business. Excellent proposition to dealers.

The Combustion Company

General Sales Office: 728 South Michigan Avenue
General Office and Factory: 4256 North Western Avenue
CHICAGO, ILLINOIS

INVESTIGATE

The Latest Herbert Magazine Water Tube Smokeless Boiler



These are a few of the Features

(1) No smoke after the fire is thoroughly started. (2) No Flues to clean. (3) Burns Soft Coal Successfully. (4) Carries steam from twelve to fifteen hours with one fire. (5) Has downdraft and direct draft to suit weather conditions. (6) It is all shell surface, which means economy. (7) Can be set in brick, which gives one more return of the hot gases. (8) No Brick Arches or other flimsy devices. (9) Natural draft and the highest economy. (10) Built in steam sizes from 500 square feet to 25,000 square feet

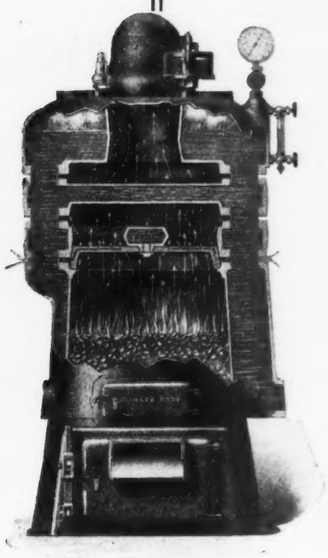
HERBERT

Has combined the downdraft feature with the direct draft and dispensed with the objectionable parts of both.

HERBERT BOILER COMPANY

Root & LaSalle Sts.

Chicago, Illinois



IMPORTANT FEATURES of the ABCO BOILERS

a new line of heating boilers that mark a decided advance in boiler construction

Heating Surface

The heating surfaces are so designed that 75% of the total water heating surface in the boiler, is prime radiant heating surface. This surface, because of its being prime radiant heating surface always remains efficient without cleaning.

An Exclusive Smokeless Feature

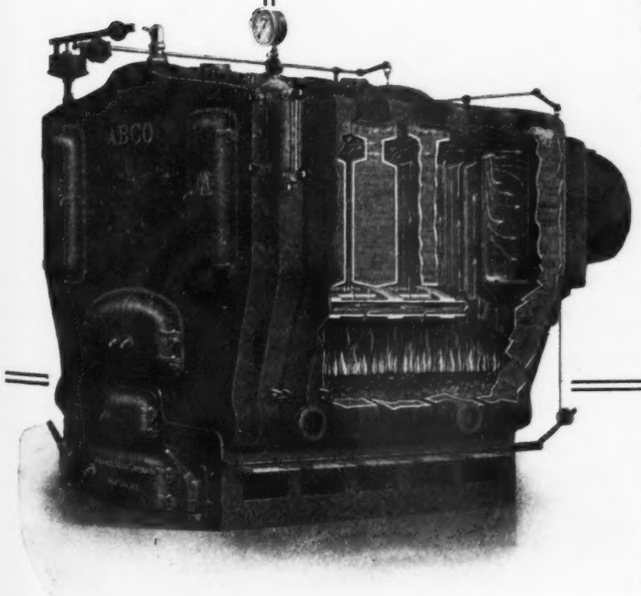
The smokeless features are designed as part of the boiler and not an attached device. Free Oxygen is distributed throughout the entire area of the grate surface above the fire in fine streams and is not introduced in a large volume at one given point.

Installation and Operation

ABCO Boilers are manufactured so they can be erected with a minimum amount of labor. Automatic draft regulation is a fixed part and eliminates pulleys and chains. Through the automatic introduction of air for initial and secondary combustion a high rate of efficiency can be obtained even by inexperienced firemen.

ABCO Boilers are fully described in a new catalog just out. It will mean a contribution to its possesser's knowledge of heating practice.

ADVANCE BOILER CORPORATION
Grand Central Terminal
New York

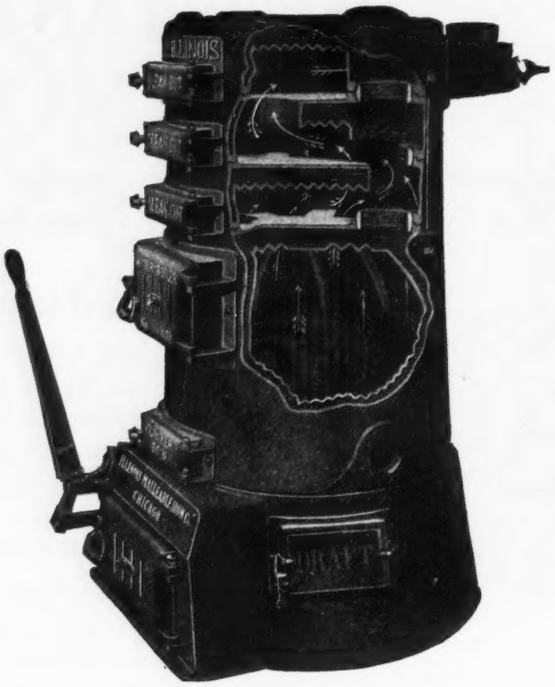


ABCO Boilers will burn anthracite and bituminous coal and coke and are rated according to the heating surface contained in the boiler. Coal capacity provides for the operation of eight hour firing periods and numerous air inlets in base afford a rapid rate of combustion if necessary.

IMICO HEATING BOILERS

For Water and Steam

Various Sizes



Imico Vacuum Heating System

Write For Catalogue

Manufactured by

ILLINOIS MALLEABLE IRON CO. Chicago, Ill.

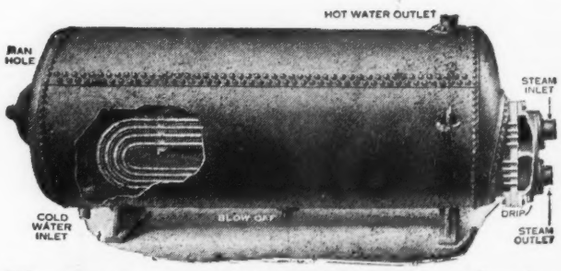
'100 Sq. Ft. of Heating Surface'

in the *Patterson Heater* means just exactly what it says

The heating surface is a nest of single '∩,' or hair pin, tubes each free to expand and contract without harmful strains.

Each tube drains instantly and no trapped water can condense incoming steam thereby greatly reducing the effective heating surface.

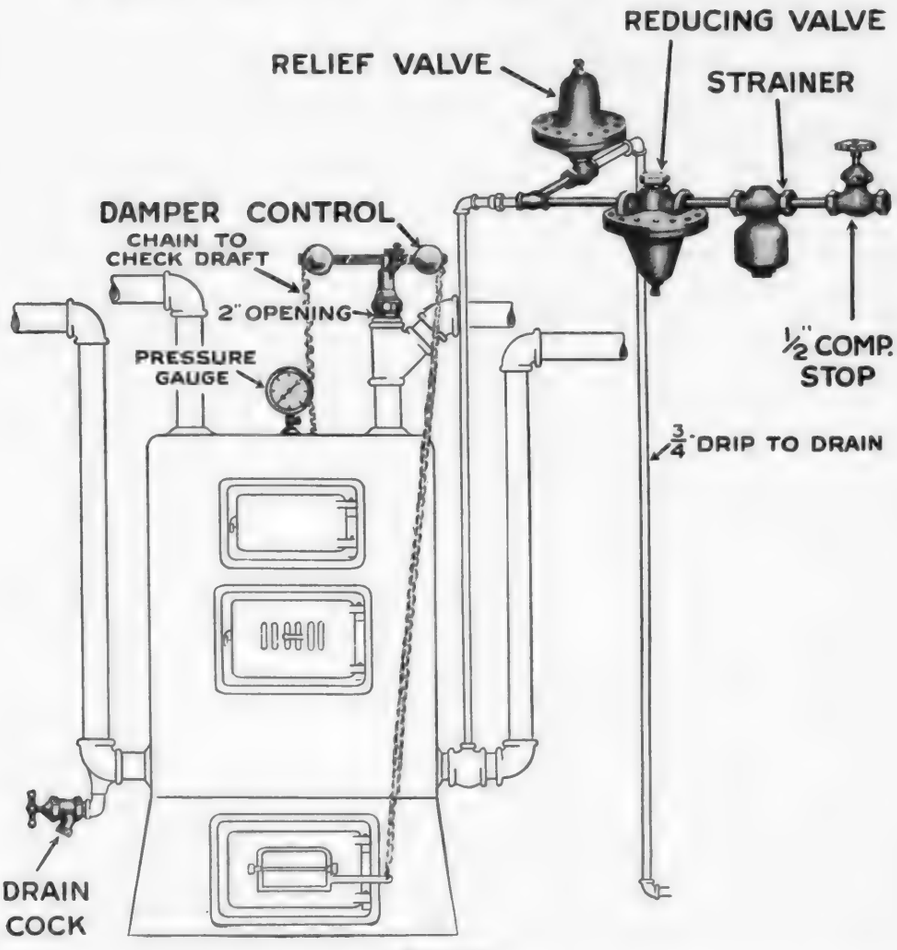
Every Sq. Ft. of Heating Surface in The Patterson is effective and 100% efficient.



The Patterson Combined Hot Water Service and Storage Heater with single, self draining, pure copper '∩' tubes.

Patterson-Kelley Co. 107 East 40th St. New York

MUELLER Automatic System— Hot Water Heat Control



(Patented)

No expansion tank, no trouble, no care—operates automatically. Keeps the system filled with water at all times and maintains rapid circulation. Works satisfactorily on any size job.

Comes assembled—quick and easy installation. Good profit for dealers at a price satisfactory to customers.

It will help you to get good heating contracts this fall. Write us for detailed information and prices.

H. MUELLER MANUFACTURING COMPANY, DECATUR, ILL.

New York
145 W. 30th St.

Sarnia, Ont.

San Francisco
635 Mission St.

GENERAL MOTORS BUILDING, DETROIT, MICH.
LARGEST OFFICE BUILDING IN THE WORLD

Another World's Largest Building Equipped With WHITLOCK Heaters

THE General Motors Building is equipped with four WHITLOCK Type K service water heaters and 2 WHITLOCK Type R swimming pool heaters.

The reason you find WHITLOCK Heaters in so many prominent buildings is due to WHITLOCK Engineering superiority.

For more than 30 years we have maintained an unequaled standard of engineering which is responsible for the unusual efficiency, operation and dependability of WHITLOCK Heaters.

Whatever your problem may be, consult WHITLOCK Engineers without cost or obligation.

THE WHITLOCK COIL PIPE CO.
World's Largest Manufacturers of Service Water Heaters
40 South Street, Hartford, Conn.
New York Chicago Boston Buffalo Philadelphia
WHITLOCK Heaters are manufactured in Canada by Darling Bros., Ltd., Montreal

WHITLOCK HEATERS

"Have Everlasting Copper Tubes"

"Wainwright" Floating Head Service Heaters

The Interior Construction of the Wainwright Vertical Floating Head Heater

Built in Vertical or Horizontal Patterns—Temperature Control Furnished if Desired

Ask for Bulletin

Consult Our Engineering Department

ALBERGER PUMP & CONDENSER CO.
140 Cedar Street, New York
Boston Chicago St. Louis Philadelphia

COMPLETE YOUR CUSTOMER'S SPECIFICATIONS WITH THE NATIONALLY ADVERTISED

EXCELSO WATER HEATERS

Sold by All Plumbers and Steamfitters

Ads appear regularly in *Saturday Evening Post, American Magazine, and Good Housekeeping.* Excelso Water Heaters provide a constant supply of hot water with

NO GAS BILLS DURING THE HEATING SEASON

The heating plant, steam or vapor, is a source of heat for the Excelso method. Heater connects on *outside* of boiler and eliminates fire-pot coil. Excelso Water Heaters are sold and endorsed by the leading boiler manufacturers

American Radiator Company
Richardson and Boynton Company
Richmond Radiator Company
Standard Heater Company
Utica Heater Company
Burnham Boiler Corporation
Pierce, Butler & Pierce Manufacturing Company
United States Radiator Corporation
International Heater Company
Boynton Furnace Company
The Wm. H. Page Boiler Company
Gurney Heater Manufacturing Company
Thatcher Furnace Company
Abendroth Brothers
Monitor Bi-Loop Radiator Company

Also by plumbing and heating jobbers everywhere

Write today for new booklet—gives full information. Tells how Excelso Method may be adapted for any heating plant; *also tells how to reduce lime deposits to minimum.*

Excelso Specialty Works
117 Clinton Street
Buffalo N. Y.

Special New York Sales Representative, John G. Kelly, 137 East 43rd Street.

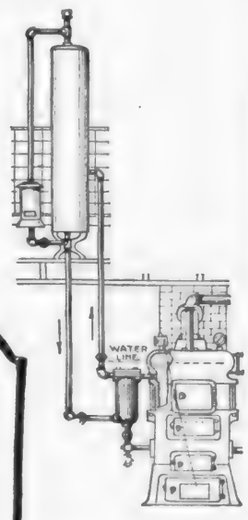
New England Representative, Daniel L. Hanson, 46 Cornhill, Boston, Mass.

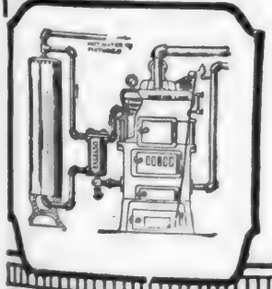
Geo. E. Kitson Co., 5029 Chester Ave,. Phila., Pa.

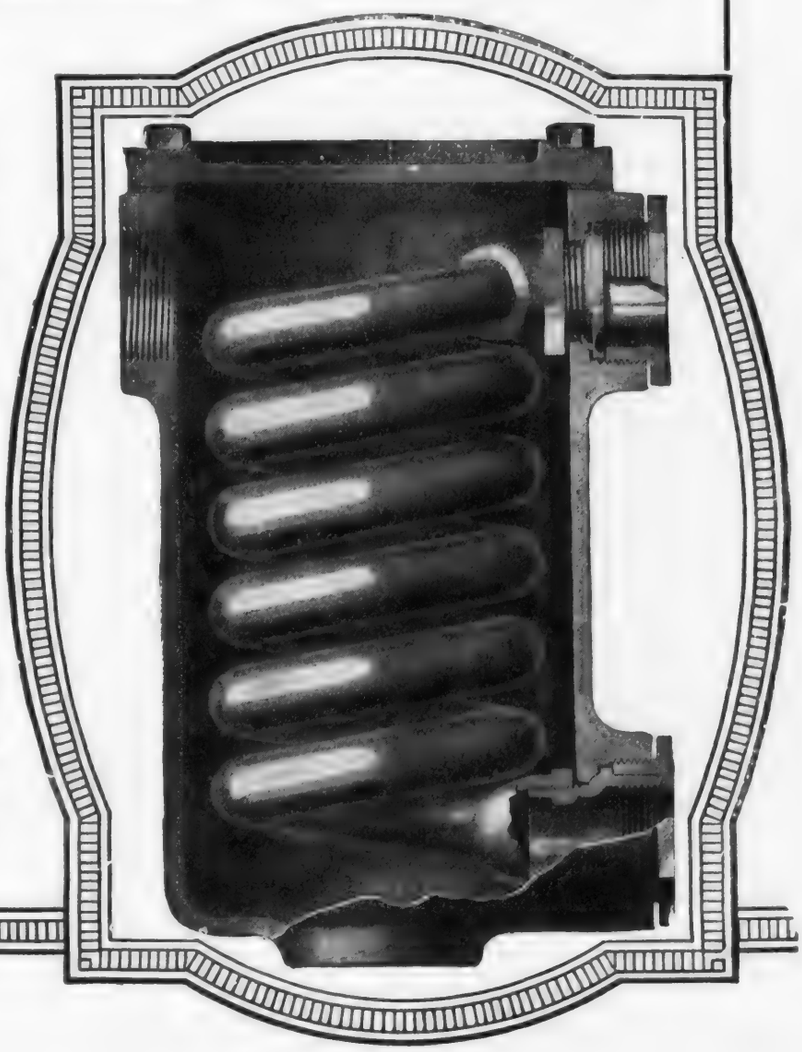
Western Sales Representative, C. N. Stedman, Wrigley Bldg., Chicago, Ill.

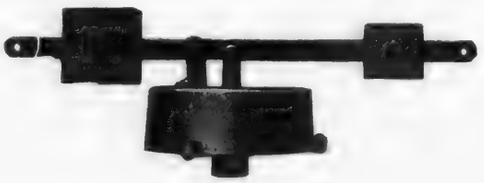
Typical Installations

Connects on Outside of Boiler









The New Metaphram Damper Regulator

We Manufacture

A complete system of apparatus for regulation of temperature and humidity for all types of buildings.

National Tank Regulators for the control of hot and cold water in tanks, reservoirs, drinking water systems, etc.

High and low pressure metaphram boiler regulators.

Expansion valves for the control of gas engines, hot water boilers and condensing coils.

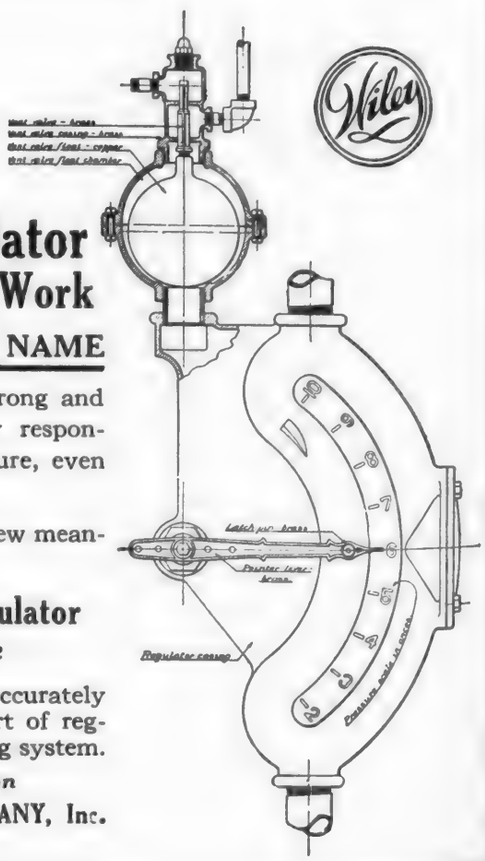
Thermostatic controllers for industrial processes, metal melting pots, annealing ovens, kilns, linotype kettles, cookers, dryers, grain dryers, air washers and humidity control, glue pots, etc.

Reducing valves, gauges, thermometers, hydraulic and electric air compressors.

NATIONAL REGULATOR CO.
FACTORY AND GENERAL OFFICES
208-212 South Jefferson Street
CHICAGO

As we studied the requirements of present day low-pressure steam, hot water and vapor heating, we saw a need for a Metaphram Damper Regulator that would be best for medium-large house heating boilers at a price below that of our Type C-7" and with a lift and power greater than those of our 4-inch regulators. As a result we designed our Type B-5½ inch, which offers manufacturers and users a most desirable equipment at a lower price. We added a most important feature in our new Offset Fulcrum, which makes it possible to adjust the lift and power of the lever through a simple adjustment of the staggered fulcrum, as is clearly shown in the accompanying illustration. Specifications: We equip this new Type B-5½" with a 40-inch lever, adjustable weights, two ceiling pulleys and 12 feet of No. 0 plumber's chain. Unlike the 4-inch size, this type has a ½-inch female connection instead of male. Shipping weight: 20 pounds.

TRADE METAPHRAM MARK REG U S PAT OFFICE



A Super-Regulator for Vapor Heating Work

POWER IS ITS MIDDLE NAME

Draft dampers are controlled with strong and steady graduated movement, accurately responsive to slightest change in boiler pressure, even to the fraction of an ounce.

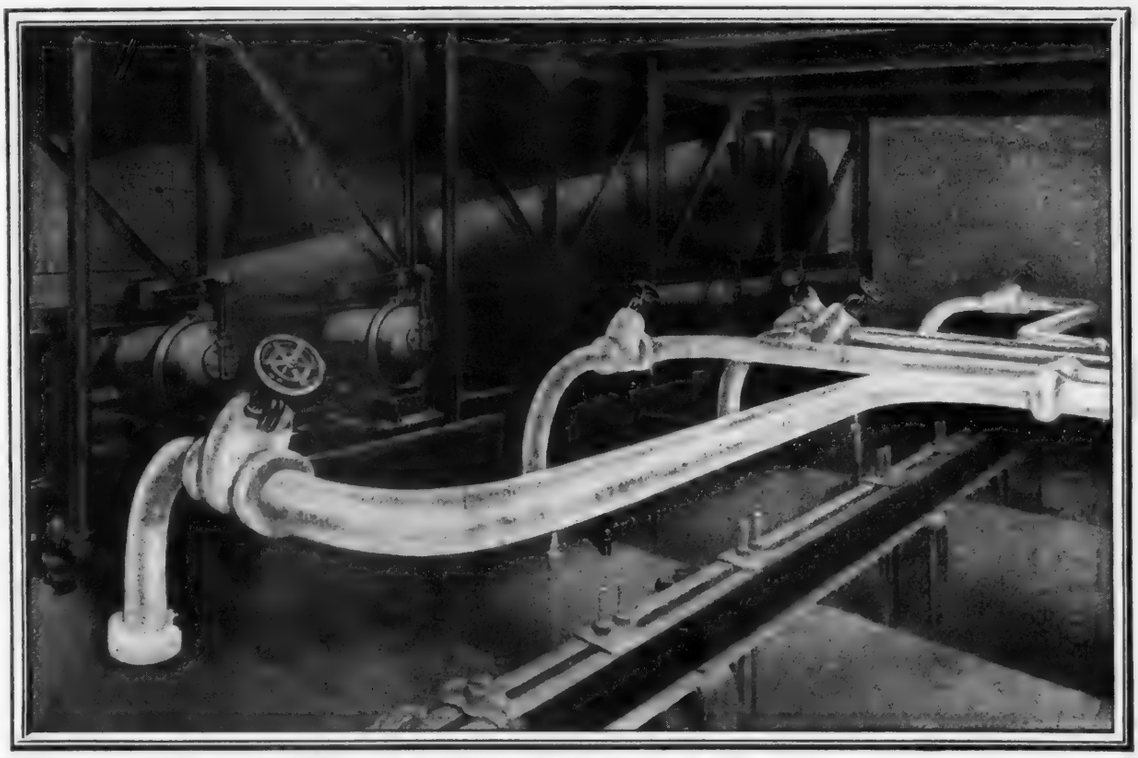
A vapor or modulating system has a new meaning when hooked to the boiler with a

Wiley Safety Vent Vapor Regulator
built for lifetime service

All working parts of cast bronze, accurately machined. Safety-Vent-Valve forms part of regulator and handles air from entire heating system.

Write for prices and full information

SIMPLEX HEATING SPECIALTY COMPANY, Inc.
LYNCHBURG, VA.



CRANE STOP-CHECK VALVE, STEAM TRAP AND SEDIMENT TRAP INSTALLATION IN BOILER ROOM—CAPITAL ELEVATOR CO., DULUTH

REDUCED POWER COSTS

The use of stop-check valves to automatically isolate any one of a bank of boilers due to a tube failure or pressure drop within that boiler; the use of properly designed pipe bends to eliminate expansion strains in the piping; the use of Cranetilt return traps to automatically feed very hot condensation into the boilers; and the use of sediment separators to isolate scale and foreign matter in pipe lines to automatic devices; all these tend to produce the most efficient boiler operation and reduce maintenance costs.

Crane stop-check valves are supplied in angle and straight-way patterns, for horizontal or vertical piping. Crane direct return traps for feeding condensation at any pressure or temperature have capacities up to 28,000 pounds per hour. Crane pipe bends are of any dimensions and material and Crane sediment traps are of any size up to 12 inches and accommodate steam pressures up to 250 pounds.

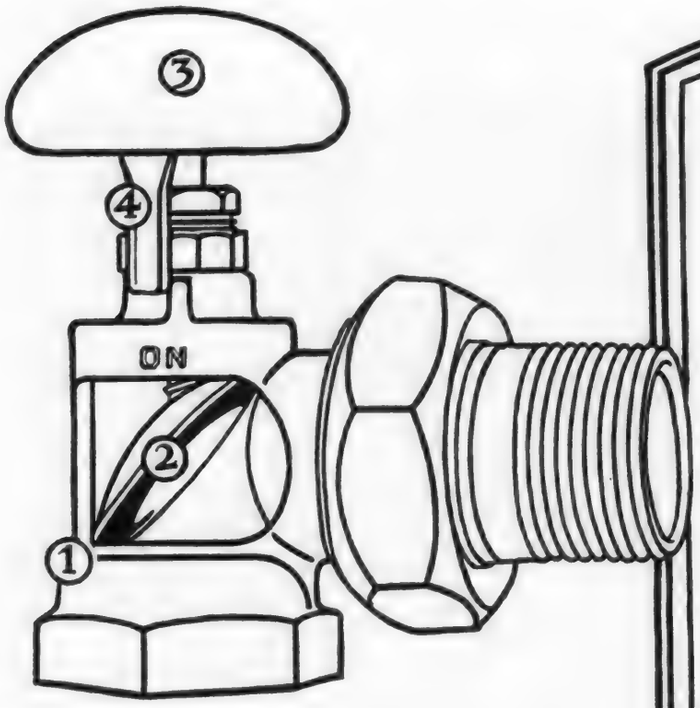
CRANE

GENERAL OFFICES: CRANE BUILDING, 836 S. MICHIGAN AVE., CHICAGO

Branches and Sales Offices in One Hundred and Thirty-five Cities

National Exhibit Rooms: Chicago, New York, Atlantic City

Works: Chicago and Bridgeport



No other hot-water radiator valve has any of these four advantages

1 The curved inlet plate has less than one-tenth the contact surface of the old-type valve. And the scraping edge keeps the contact surface clean so corrosion can't stick the valve.

2 The curved inlet plate makes the water *curve* into the radiator, instead of bumping into the old square-cornered turn.

3 The handle is of a new design—non-breakable and non-heat-conducting. It is handsome in appearance with a permanent, black, hard-rubber finish.

4 An indicator attached to the handle travels between two stops, showing at a glance whether the valve is on, or off, or in an intermediate position.

Four exclusive advantages

—yet this new "Genuine Detroit" costs no more than ordinary hot-water radiator valves

NO other hot-water valve in the world has any of the four advantages shown above. Yet this Genuine Detroit Hot-Water Radiator Valve *costs not one cent more.* So why take chances on ordinary types?

One feature of this new valve alone—the fact that *the water curves* into the radiator—eliminates friction troubles on hot-water valves. Careful installations have gone wrong and cost the contractor money—simply because the water would not circulate properly through the old-type, square-turn valve.

The Detroit Lubricator Company is the largest maker of radiator valves in the world. They are specialists in radiator valve construction. You can't afford not to know about their latest development. Your jobber can supply you with a "Genuine Detroit" radiator valve for every heating need.

"GENUINE DETROIT"

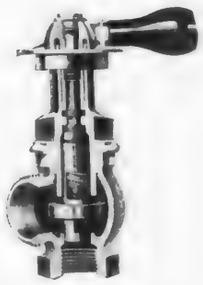
BRANCH OFFICES
2709 Grand Central Terminal
New York City
1328 Tribune Building
Chicago
1059-65 Monadnock Building
San Francisco

DETROIT LUBRICATOR COMPANY

DETROIT, U. S. A.

"GENUINE 101 DETROIT"
Hot Water Radiator Valves

THE "SQUARE DEAL" VALVES



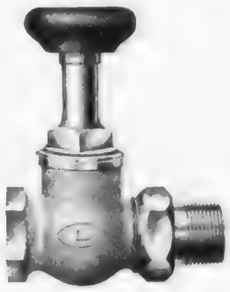
The Lavigne Packless Steam Radiator Valves give you, your client and the heating system which you have sponsored—a square deal.

After having designed a system and installed it nothing is more discouraging than to have it get out of order through poorly constructed valves. Invariably, the client blames the whole system and condemns everyone and everything connected with it.

To forestall this, specify **Lavigne Packless Steam Valves**—the square deal valves. They are made with the knowledge of their importance to the heating system. Of proven design and simple construction, with the fine, careful workmanship which each part is manufactured they are leakless, quick opening and non sticking.

A complete range of styles and sizes satisfies every requirement for Vapor, Vacuum, Central Station or Low Pressure Steam Heating Systems. Your Jobber will supply you.

Made in Angle, Globe, Right or left hand corner styles; furnished with Round Wheel or Plain Lever Handle, Graduated Dial with Lever Handle or Round Wheel, also Lock Shield, either plain or Graduated.



YOUR JOBBER CAN SUPPLY YOU

COMMONWEALTH BRASS CORPORATION

DETROIT MICHIGAN

NEW YORK
48 E. 41st Street

CHICAGO
332 So. Michigan Avenue

SAN FRANCISCO
68 Post Street

HEAT INSURANCE

For the Life of the Heating System

DOLE Sure-Vent Air Valves are guaranteed to operate efficiently throughout the life of the heating system on which they are installed.

They keep the heating system working under all conditions. The Sure-Vent provides a positive outlet for air ***all the time.*** Even if waterlogged—which seldom occurs—a touch on the push-button restores the automatic action at once.

The Sure-Vent requires no attention, once it's installed. It works without any assistance.

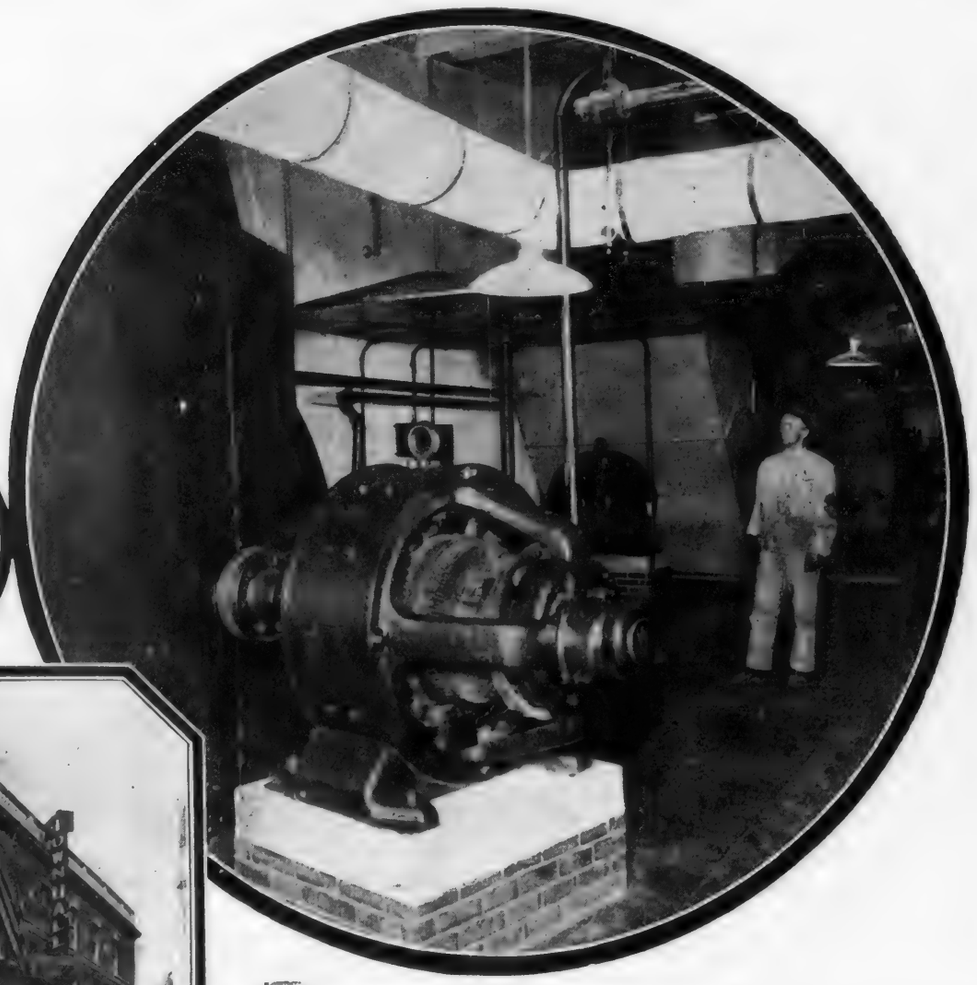
Thoroughly tested and adjusted before they leave the factory.

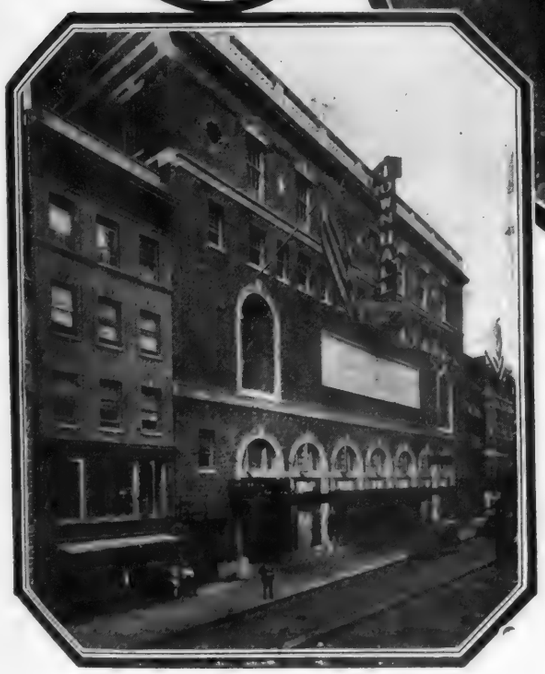
Send today for free booklet "Upstairs and Downstairs," describing the twelve points of superiority of the Dole Sure-Vent Air Valve.

DOLE VALVE COMPANY

1931 CARROLL AVENUE, CHICAGO

Makers of "Dole" Packless and Modulating Radiator Valves





The Townhall of the League for Political Education, New York City

Another New York Installation

The Town Hall for the League of Political Education is another of New York's recent structures in which the ventilating equipment is Westinghouse Motor-Driven.

Together with the Bankers' Trust Building, the Seaboard National Bank and the Mt. Sinai Hospital, it represents a list of New York's latest and finest buildings. All are Westinghouse Equipped.

Westinghouse has a complete line of ventilating motors of all sizes, styles and types applicable to all industrial, private or public ventilating systems.

Westinghouse Electric & Mfg.Co.
East Pittsburgh Pa.

Offices in all Principal American Cities

Westinghouse

It's the Combination!

That's it exactly. The combination of an automatically controlled centrifugal water pump, and vacuum pump impeller in one, that puts

The Hydro-High Vacuum Pump

in a class by itself. Architects, heating engineers and contractors specify **Hydro.**

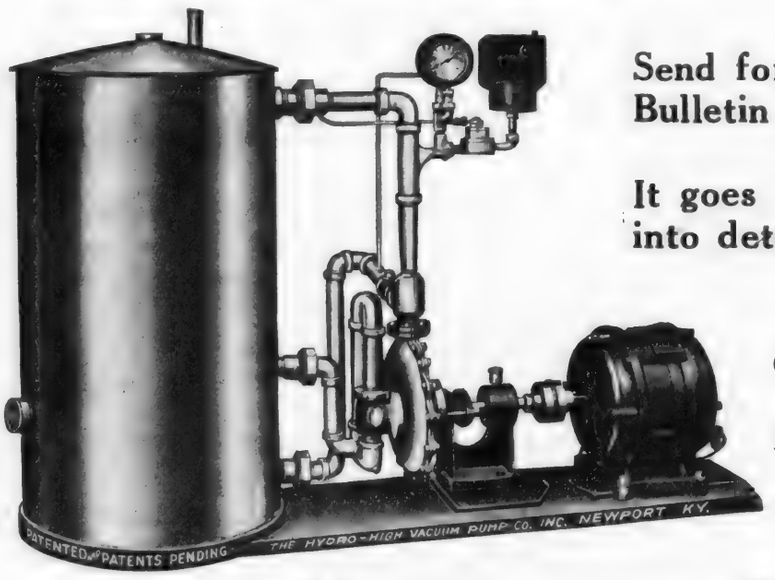
WHY?

—because it is controlled so that it operates only when it has work to do, thereby limiting the amount of current consumed.

—because it is of simple construction and has fewer wearing parts than other pumps.

—because it is thorough in its operation and requires very little floor space.

—because it maintains an almost perfect vacuum at 85° F. and will obtain 15 inches of vacuum at 190° F.



Send for Bulletin No. 100

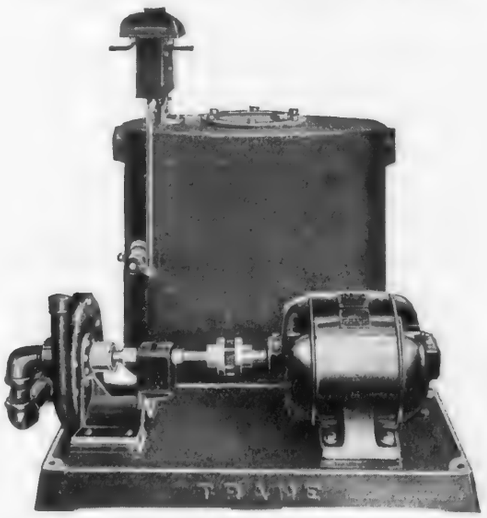
It goes into details

Opportunities for Representatives

The Hydro-High Vacuum Pump Co
INCORPORATED

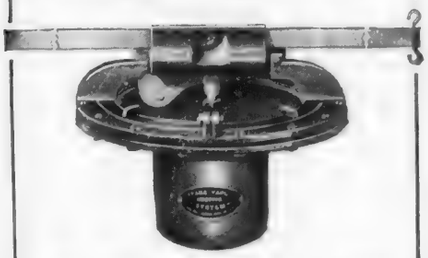
NEWPORT KENTUCKY

The Pump that Trane builds---



TRANE HEATING SPECIALTIES

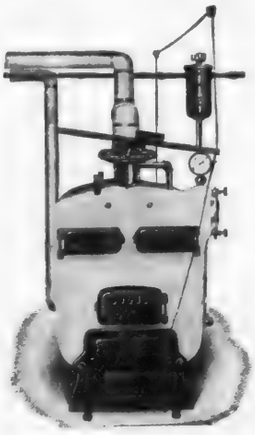
Trane's 8-to-1 Damper Regulator



An ounce on the boiler gives eight ounces on the arm. Two ounces on the boiler give a pound on the arm. Ratio is 8 to 1.

When once set for any desired boiler pressure, an ounce change is sufficient to open or close a damper and check. It is a precision instrument; built carefully as a watch, yet rugged as the boiler itself.

Always used for Trane System Vapor Heating; often specified for other vapor and low-pressure steam jobs. Literature on request.

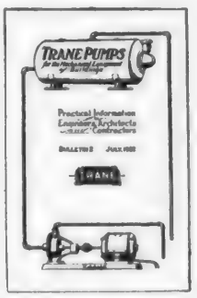


A STUDY IN SIMPLICITY

Boiler connections for a Trane RETURN FITTING Vapor System, showing the Trane Damper Regulator and Trane Receiver in position.

TRANE SYSTEM VAPOR HEATING
"Heat at the turn of a valve"

Ready now—



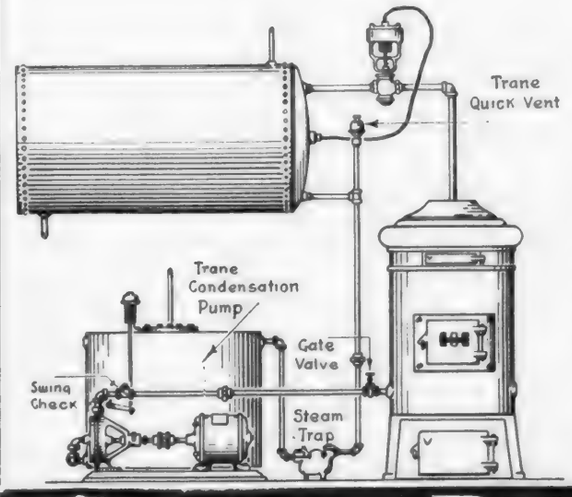
10TH EDITION
24 p. 6 x 9 inches

Official Bulletin of Pump Division, Trane Engineering Department. Practical data and engineering information on condensation, circulating, and all similar pumps. Free to contractors, engineers, and architects.

Smallest stock size pump built by Trane. Handles 6 to 8 gallons of water per minute against a maximum boiler pressure of 5 pounds. (Regular sizes work against 5 to 60 pounds pressure; larger if you need them.) Centrifugal type, electrically driven, direct connected through flexible leather coupling. Automatic float switch. All features of the larger Trane pumps are incorporated into this efficient, compact junior model. Particularly desirable for pumping work outside the ordinary field, an instance of which is illustrated below. New Bulletin 2 tells all about it.

The Trane Company
La Crosse, Wis.
206 Cameron Avenue

Chicago, New York, Boston, Philadelphia, Buffalo, Detroit, Cleveland, Salt Lake City Portland, Knoxville, Greensboro, N. C.



APPLICATION OF TRANE CONDENSATION PUMP TO REMEDY DEFECTIVE WATER HEATER INSTALLATION. Used where pressure drop through water heater is high, preventing return of condensation by gravity.

TRANE PUMPS

ILLINOIS
HEATING SYSTEMS
Make Warm Friends

CONWAY BUILDING, CHICAGO
2,800 Radiators
Graham, Anderson, Probst & White, Architects

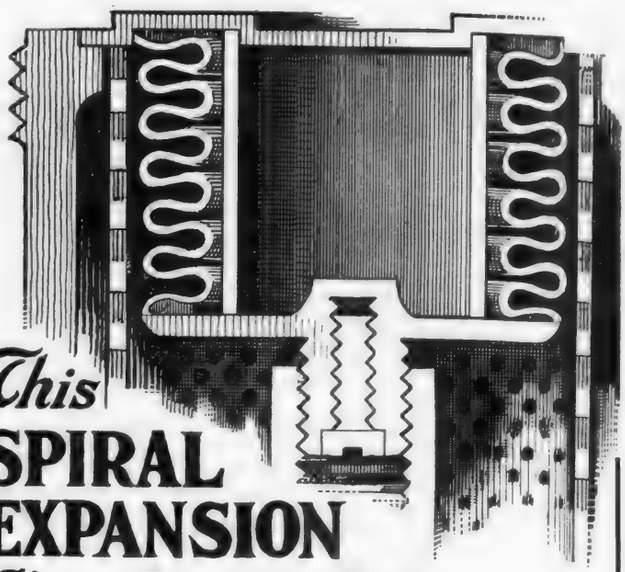
OVER 20 years of specialized effort in the heating field—thousands of successful installations—and a nation wide engineering and service organization, combine to insure the

"BEST IN MODERN HEATING"

Illustrated catalog and data bulletins sent upon request.

GIFFORD PRODUCTS

ILLINOIS
ENGINEERING COMPANY
INCORPORATED 1900
CHICAGO
REPRESENTATIVES IN 26 CITIES



This SPIRAL EXPANSION *Gives Longer Life*

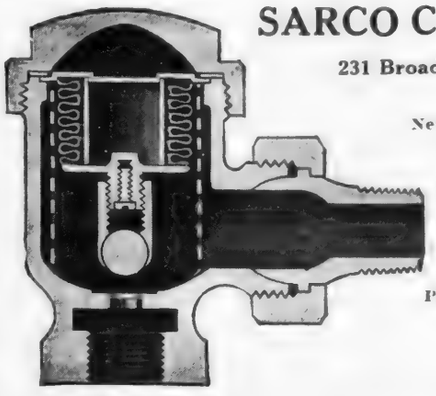
Instead of an annularly corrugated expansion element, the Radiator Trap Sarco contains a spirally corrugated tube. With this design the movement at any turn of the tube is so slight as to be hardly detectable. The movement is distributed over the whole area instead of being confined to a few points, and this lengthens the life of the tube and the efficiency of the trap.

Wear on the valve is minimized, too. The bronze metal ball, which fits snugly into the socket seat, works freely in all directions, distributing wear evenly and insuring perfect contact at all times in the

RADIATOR TRAP
SARCO

Another feature of the Sarco that adds to its long life is the construction which prevents scale and dirt collecting in the valve. Line contact only is had between the ball and seat of the valve and this makes it practically impossible for scale to collect. The Radiator Trap Sarco is of unusually heavy construction and it is factory adjusted.

Other important advantages are explained in our booklet P-107. Send for it.



SARCO CO., Inc.
231 Broadway
New York City
Buffalo
Chicago
Cleveland
Detroit
Philadelphia

"Say Andy!

We can't take any chances on this job"

"Here are the plans for the First National Bank building—a large building, six stories high. The building committee has put the heating up to me. The job's got to be right—no come-backs—no alibies. You know we are dealing with big people and you know what it will mean to us if we satisfy them."

"I get you boss, you don't want to gamble on the results. We can put in a clean, simple, positive, dependable job that's free from all 'come-backs'. That's what these fellows want. They are bankers and busy men and cannot fuss around with the heating system to get results. The simpler it is, the better. They don't want a lot of complicated devices that are always getting out of order and needing repairs."

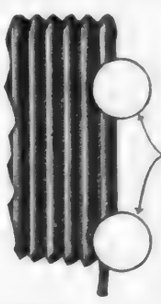
"You've got the idea, Andy, and I'll bet a $5 bill to a doughnut that I know what system you are thinking about—the system that is as simple as A. B. C. that needs no complicated devices to keep up circulation, yet it heats every radiator at the same time, no matter where it is located, with practically no pressure—just a few ounces. It is as noiseless as hot water, and much quicker. We've tried it Andy, and we know, don't we."

"You've said it, boss. And those Construction Details that go with every Moline Heat plant, are alone worth the price. As your superintendent, I can look after four Moline Heat jobs while I am worrying around with one of the others, and that means profit to us. And your mind is free, boss. You can keep busy going after new business and that's what we are after."

"Yes, Andy, I'll roll up these plans and send them to Moline Heat today and ask them to give us their proposition. Now, that's off my mind."

Mr. Contractor, you have heard of Moline Heat, but have you tried it? Investigate any Moline Heat installation and you will then know why it will prove a business building profit-maker for you.

If you are estimating a heating job, roll up the plans and send them to us and get our proposition. Submit our proposal to your customer—and see what happens. The Herman Nelson Corporation, Dept. H2, Moline, Illinois.



MOLINE Heat Simple Equipment, combined with Moline Heat Scientific Method of Steam Circulation and Piping Design, eliminates the necessity of using Automatic Air Vents, Automatic Radiator Return Traps or Vacuum Pumps of Any Kind on 90% of all heating problems

Moline Heat
EVERYWHERE
TRADE MARK

VAPOR MOUAT HEAT

VAPOR MOUAT HEAT

The **Good Samaritan Hospital** *of* **Vincennes, Indiana.**

is equipped with the Mouat Vapor Heating System and consequently has positive heat control in each room without the use of vacuum pumps, traps or thermostatic valves.

The story of how this is done is interesting and instructive. Send for it.

Mouat Squires Co., Cleveland, O.

Hotel Pennsylvania, N. Y., Webster Equipped

In the hotel—

as in every other type of building, Webster Systems of Steam Heating are pre-eminent.

Whether it be a country town hotel of less than a hundred rooms or a huge city hotel of a thousand rooms or more, the wide adaptability of Webster Systems of Steam Heating, proven in over 17,000 installations, assures exactly suitable heating equipment for any given requirements.

The 33-year experience of the Webster organization is at the disposal of architects and engineers in planning and installing heating equipment for any type or size of building.

May we describe the details of Webster equipment and Webster Service to you? Write for bulletins. 155

Warren Webster & Company

Main Office and Works
Camden, N. J.

Branch Offices in 35 Cities

MODULATION SYSTEM OF STEAM HEATING
VACUUM SYSTEM OF STEAM HEATING
STEAM AND OIL SEPARATORS
FEED WATER HEATERS
STEAM SPECIALTIES

At Last!

A SINGLE PIPE VAPOR SYSTEM

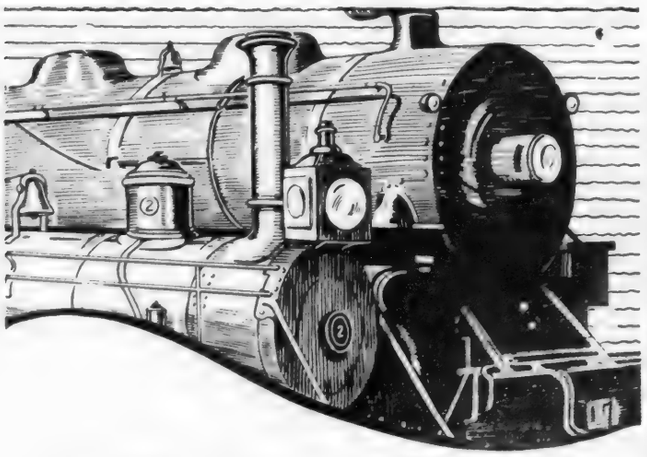
Simple to install
Efficient in operation
Low in cost

Descriptive matter sent on request

GORTON & LIDGERWOOD CO.

96 Liberty Street, New York

FISHER BUILDING, CHICAGO, ILL.



It would be absurd to judge engines by the size of their smokestacks—no more can Steam Traps be gauged by the size of their connections.

The average trap having a 1½" pipe connection has only ¼" orifice—*the pipe connection is thirty-six times greater than the discharge valve orifice*

AMERICAN IDEAL STEAM TRAP

has a valve discharge orifice the same size as the inlet in low-pressure traps, while the high-pressure traps also have a larger hole in the discharge valve than any other trap having the same size inlet.

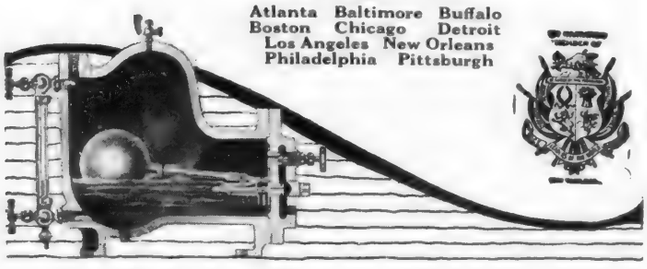
As a result, it requires a much larger and consequently more expensive trap of other makes to handle the same quantity of condensation.

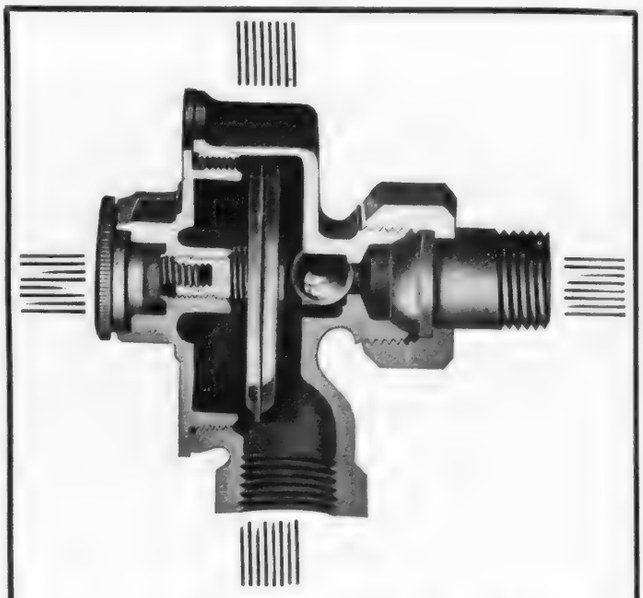
The large orifice in the American Ideal is possible only because of its tremendous leverage. And its powerful leverage permits the use of a larger, heavier float—a float strong and durable enough to withstand the highest pressure—a float we can guarantee for the full life of the trap.

Other advantages in the use of American Ideal traps are explained in our interesting booklet. May we send you a copy?

Schaeffer & Budenberg Mfg. Co.
AND
American Steam Gauge & Valve
MFG. CO. DIVISION

BROOKLYN, N. Y.
Atlanta Baltimore Buffalo
Boston Chicago Detroit
Los Angeles New Orleans
Philadelphia Pittsburgh





A high grade thermostatic return trap

with the non-corrosive ball check feature

How it operates:

The non-corrosive ball-check operates on a smooth guide or track, and is rolled to its seat against vapor or steam by the expansion of gas in the thermal member. When the radiator supply valves are closed, condensation of the steam forms a vacuum in the radiators which holds the balls to their seats, permitting all water in the return lines to flow freely back to the boiler, thereby eliminating the danger of broken boiler sections and preventing steam or vapor short-circuiting into radiators through return risers.

Boiler Insurance

The O-E Combination Ball-Check Trap is the only trap made with the check feature, and it costs no more than an ordinary return trap. Engineers and Architects will specify "O-E" No. 2 as insurance against boiler domage, this insurance alone being worth more than the reasonable price asked.

O-E Specialty Manufacturing Co.

Manufacturers of the

Celebrated "O-E 3-in-1" Heating Specialties

MILWAUKEE, WISCONSIN

Service and Sales Offices
of
The Bishop & Babcock Co.

Amsterdam, N. Y.
F. E. Dwyer
447 Guy Park Ave.

Atlanta, Ga.
D. F. Stevenson
60 W. Mitchell St.

Birmingham, Ala.
R. L. Hicks
216½ N. 21st St.

Boston, Mass.
W. D. Cashin & Co.
35 Hartford St.

Buffalo, N. Y.
M. C. Beman, 311 White Bldg.

Charlotte, N. C.
I. Hardeman Co.

Chicago, Ill.
E. Vernon Hill Co.
64 W. Randolph St.

Cincinnati, O.
C. R. Lingo Eng'g. Sales Co.
901 Gerke Bldg.

Cleveland, Ohio
General Offices
1200 E. 55th St.

Dallas, Tex.
Fred Colbert,
1106 Commerce St.

Denver, Colo.
A. G. Reuter
1724 Lawrence St.

Detroit, Mich.
T. R. Woolley
2-133 General Motors Bldg.

Kansas City, Mo.
Engineering Sales Co.
1314 McGee St.

Minneapolis, Minn.
W. P. Nevins Co.
120 S. 9th St.

Nashville, Tenn.
Ryan Sales Co.
922 Stalkman Bldg.

New York City
W. D. Cashin & Co.
5613 Grand Central Term.

Okla. City, Okla.
Federal Steam Spec. Co.
17 N. Dewey St.

Omaha, Nebr.
Omaha Sanitary Sup. Co.
151 Jackson St.

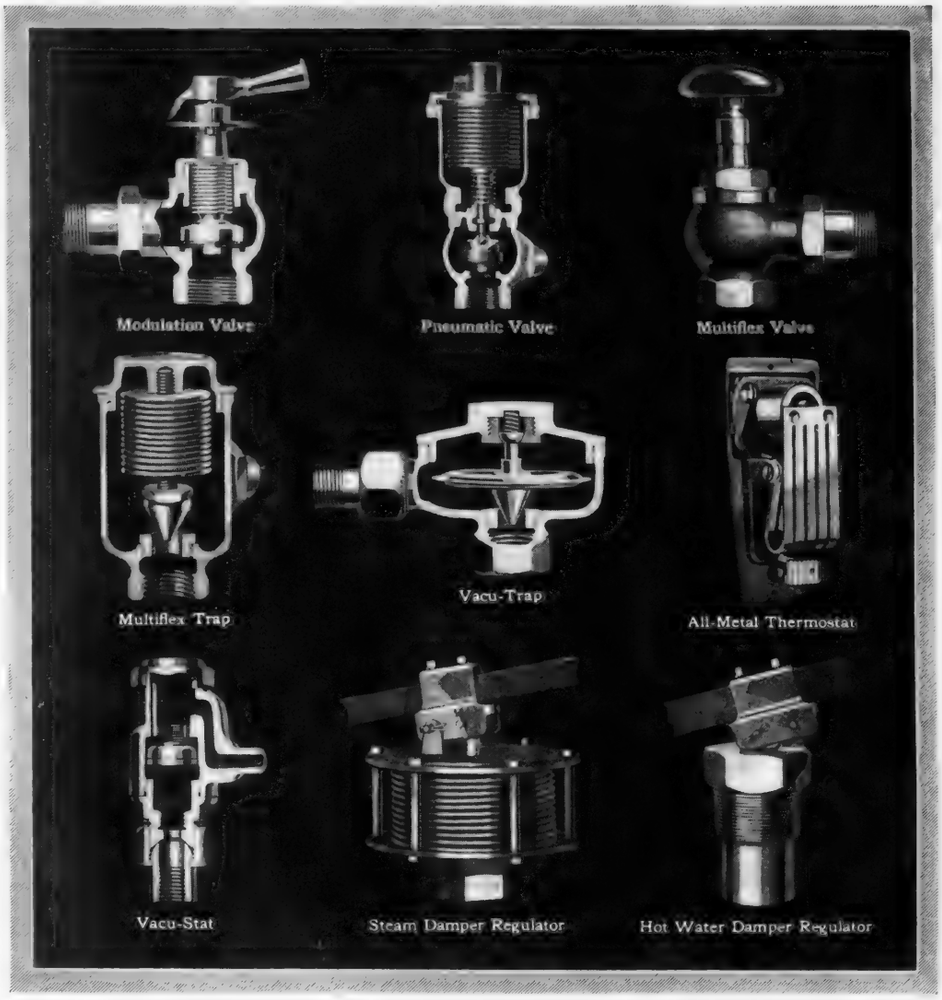
Philadelphia, Pa.
Alexander & McDevitt
30 S. 17th St.

Pittsburgh, Pa.
E. A. Hauschildt,
412 Third Ave.

Richmond, Va.
Virginia Equip. & Sup. Co.

St. Louis, Mo.
P.-K. Engineers
1511 Olive St.

Williamsport, Pa.
E. Keeler Co.



Now Represented in 23 Important Cities

IN the left hand column are listed the twenty-three offices representing the B. & B. Line of Heating Specialties.

It is important to note that each office also represents the B. & B. Service-Plan of personal co-operation.

The standing of the men who make up the B. & B. field organization means more than prompt and satisfactory co-operation; it offers unquestionable evidence of the unusual efficiency and value of the B. & B. Line.

We suggest you get in touch with the nearest B. & B. office on all types of heating installations from the monumental skyscraper to the modest cottage.

You will find that contact with our representative is of genuine technical interest and of either direct or indirect financial value.

7 FOLDERS have been prepared, illustrating and describing the speciaities shown above. Illustrated bulletins are also available on the B. & B. Air Line System of Steam Circulation and the B. & B. Temperature Control System. For printed literature write the nearest B. & B. office or the general offices, Cleveland, Ohio.

THE BISHOP & BABCOCK CO.

GENERAL OFFICES AND FACTORIES - - CLEVELAND, OHIO

The B&B Line—World's Most Complete Line of Heating Specialties

VACUUM TRAPS · MULTIFLEX TRAPS · MULTIFLEX VALVES · DAMPER REGULATORS · VENT VALVES · BLAST TRAPS · VACU-STATS · REDUCING VALVES · THERMOSTATS · PNEUMATIC VALVES

Better Control of Steam Saves More Money

The well-known Adsco Graduated Radiator Valve, that gives closest graduation—better control of Steam, is now PACKLESS. It has a two-piece non-rising stem that is more positive and durable—never sticks—never leaks—never needs repacking. Nickeled all over,—nickle letters on black dial—it is most attractive.

You can use the Adsco Valve on any steam or vapor system. It is of special value with the Adsco Regulator and other Adsco specialties used in Adsco Heating, with any make of steam boiler.

With Adsco Heating it is not necessary to use traps or air valves.

The Adsco Valve and the other Adsco Specialties used in Adsco Heating are not sold as a part of engineering service, but as merchandise at a uniform price. When desired, we will furnish engineering service at a moderate fee.

Ask for Bulletin No. 158-H covering Adsco Heating for individual buildings, and including the Adsco Specialties; Bulletin No. 20-H covers Adsco Community Heating of a group of buildings from Central Station Steam Plant. Architects, engineers and contractors should also ask for Bulletin No. 159-H.

AMERICAN DISTRICT STEAM COMPANY

GENERAL OFFICES AND WORKS

NORTH TONAWANDA, N.Y.

Offices: New York, Chicago, Seattle, Pittsburgh

ADSCO HEATING

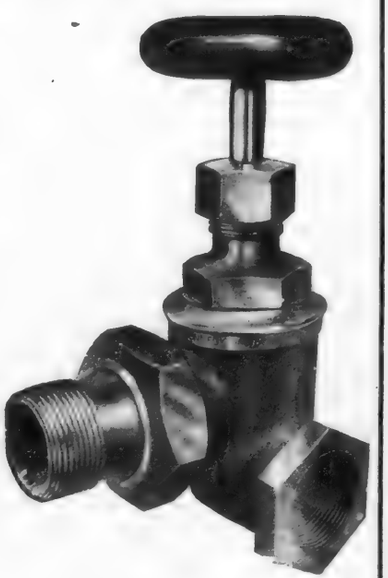
KENNEDY

RENEWABLE-DISC RADIATOR VALVES

Unfailing reliabilty of service, reasonable prices and the guarantee of satisfaction that a long established company is able to furnish, make Kennedy Radiator Valves the best buy for steam and hot water service on the market.

We can honestly recommend them for use anywhere, and invite a close scrutiny of those points of design and construction that set them apart as decidedly superior. They come in every desirable type—straightaway, angle, offset, corner, etc.

Other Kennedy Valves for handling water, steam, oil, acids, gas, alkalies, etc., in more than 500 distinct types and sizes are at your service. Our catalogue illustrates and lists them all. Send for a copy.



THE KENNEDY VALVE MFG. CO., ELMIRA, N.Y.

New York: 95 John Street

SAN FRANCISCO: 23-25 Minna St.

BOSTON: 47 India St., CHICAGO: 204-8 N. Jefferson, St.

EXPORT OFFICE: 95 John St., New York City

SALES OFFICES:

Seattle, L. C. Smith Bldg. Salt Lake City, 503 Dooley Bldg.

El Paso, 704 Two Republics Bldg.

ALLEN AIR-TURBINE VENTILATOR

Standard of Ventilating Efficiency

Wherever ventilation is desired—in factories, foundries, stores, schools, hotels, churches, theatres, residences, kitchens, bakeries, tanneries, barns, stables, garages, chimneys, air shafts, or wherever air circulation is required, Allen Air-Turbines *have proven the best, cheapest and most efficient* ventilating system known.

Many of America's largest architects, engineers and industrial concerns have adopted and endorse Allen Air-Turbine Ventilators.

Patented

Our air displacement is measurable and the figures given are guaranteed to be correct.

Diameter of Pipe	Air Displacement Cu. Ft. per Hour	
	Wind Velocity 4 Miles per Hour	Wind Velocity 8 Miles per Hour
8 Inches	17,300	21,600
10 "	26,500	32,500
12 "	38,600	46,200
15 "	54,000	69,000
18 "	85,200	102,100
20 "	105,100	125,600
24 "	149,000	185,000
30 "	225,000	272,000
36 "	281,000	330,000
42 "	324,000	414,000
48 "	360,000	473,000

CARRIES OFF
GASES
MOISTURE
STEAM
SMOKE
VAPOR
FOUL AIR
ODORS
HEAT
FUMES
DUST
DAMPNESS

Write for Detailed Literature

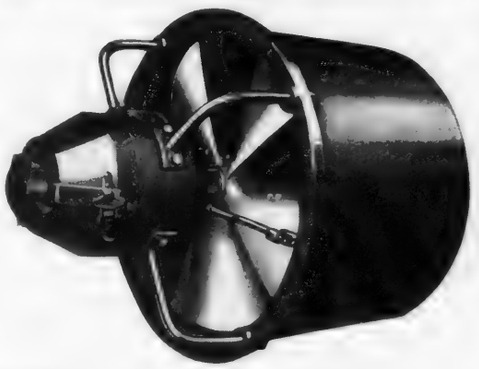
ALLEN AIR-TURBINE VENTILATOR CO.
DETROIT Eighth and Porter Sts. **MICHIGAN**

Why not Undergrate Draft for Heating Boilers?

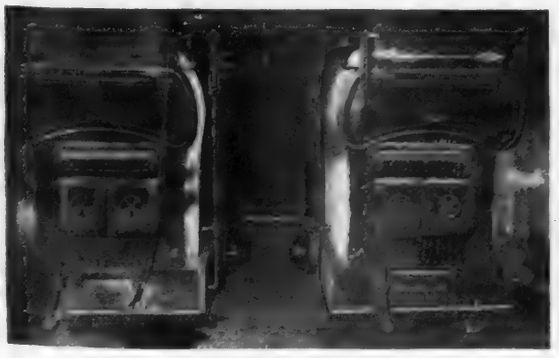
The same advantages are available as when operating high pressure power boilers.

Greater steaming capacity, ability to burn any grade of coal, quick pick-up, operation for longer periods without cleaning, and assurance at all times of a sufficient head of steam.

These results are obtained quickly, without long delays, by the use of the



Wing Type EM Blower



The Type EM Blower is a simple, inexpensive, undergrate blower developed especially for this type of plant. No space required, no belting, no foundations—just two motor bearings to lubricate. And an efficiency that cannot be exceeded. The cut at the left shows the simplicity and "out-of-the-wayness" of the installation.

These blowers are easily applied to boilers of the Economic, return tubular, cast iron sectional, or any other type. Completely described in our

New Bulletin 16. Ask for a Copy

L.J. Wing Mfg Co.

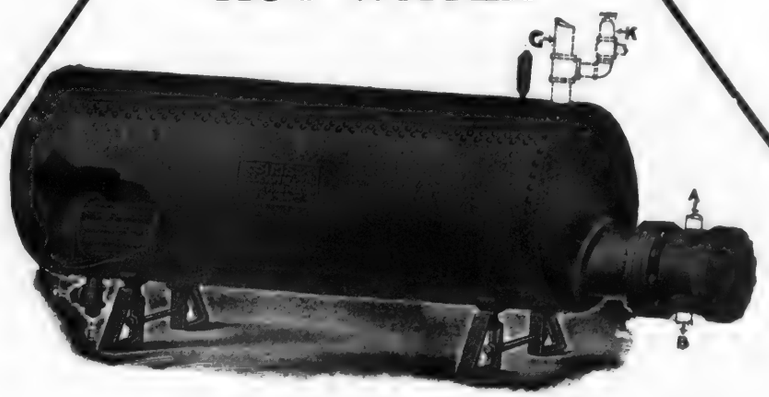
FANS and BLOWERS | UNIT HEATERS DAMPER REGULATORS | SMALL TURBINES

Hudson and 13th Sts., New York

Sims Clean E-Z Steam Tube Heater

Especially Designed for Supplying Large Quantities of Hot Water

Sims MEETS THAT PEAK DEMAND FOR HOT WATER



For Hotels, Apartment Buildings, Hospitals, Y. M. C. A. Buildings, Schools, etc.

"We keep others in Hot Water"

THE SIMS CO., 18th St., Erie Pa.

Thos. Hoye, Htg. Cont.

McALEAR

Radiator Traps

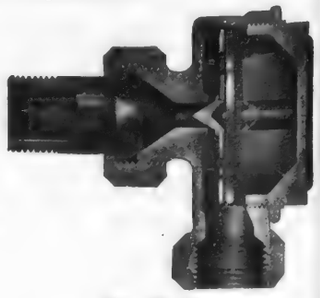
are noted for their
Efficiency
Economy
Simplicity
Accessibility
Long-Life

and are
Non-Adjustable
Positive in Action
Noiseless in Operation

Milwaukee Athletic Club, Milwaukee, Wis.

Completely Equipped
McAlear Radiator Traps
McAlear Steam Specialties

Ask for Literature



No. 28 Trap

McALEAR MFG. CO.
CHICAGO

The Heating and Ventilating Magazine

VOL. XIX. NO. 10

CONTENTS FOR OCTOBER, 1922

Ozone and the Cure of Disease.....*James Todd* 33
Typical Treatments of Tuberculosis and Influenza-Pneumonia with Oxidized Compounds and Ozonized Air.

Contracts to Install Heating Equipment.....*A. L. H. Street* 37
Legal Points Concerning Rights and Liabilities Which Have Caused Litigation.

Heating and Ventilating the Earth.....*G. J. O'Connor* 38
A Conception of the Vast Air Movements and Heat Exchanges Throughout the World Which Mark the Hand of the Master Engineer.

A Study in Department Store Ventilation.....*J. M. Robb* 40
Novel Methods Proposed for Eliminating Dust and Providing for Proper Air Diffusion.

An English Method of Figuring Heat Losses.....*W. W. Nobbs* 43

The Fallacy of Superheating Exhaust Steam.....

Service Department..... 47
Steam Consumption of Kitchen Equipment.
Rate of Heat Transmission Through Tubes of Water Service Heaters.

Use of Coke in Homes Urged by Bureau of Mines..... 49

The Oil Supply of the World..... 50

Fuel-Oil Data..... 50

Methods of Heating Fuel-Oil..... 51

Types of Fuel-Oil Burners for Household Use..... 53
2—Kleen Heet Oil-Burning System.

Making a Pipe Flow Formula Easier to Use..... 54

Building and Contracting Leaders Choose Basic Books of Industry..... 54

New York State's Fuel Rationing Law..... 55

Faults in a Heating System..... 55

Comparative Cost of Various Heating Methods..... 55

Novel Applications of Electric Heaters.....*T. W. Reynolds* 56

Portable Unit Fan Blast Heaters..... 58
VI—Sturtevant Unit Heaters.

Bibliographies on Heating and Ventilation..... 59

National Trade Extension Bureau..... 61
Launching of National Apprenticeship Campaign.

Good Health Week, October 23-30, 1922..... 61
Stage Set for Good Health Week Campaign.

Developments in the Fuel Situation..... 66
Revised Priority Order Issued by the Interstate Commerce Commission.
National Fuel Administration.

Heating and Ventilating Data Sheets..... 68
No. 13-U —Radiation Computing—Water Heating, 18-In. Brick Wall.
No. 13-V —Radiation Computing—Water Heating, 21-In. Brick Wall.
No. 13-W—Radiation Computing—Water Heating, 24-In. Brick Wall.
No. 13-X —Radiation Computing—Water Heating, 16-In. Stone or Concrete Wall.

Advertisers' Index, Page 106

Engineers' Specification Index, Page 100

YEARLY SUBSCRIPTION $2.00 **SINGLE COPIES, 20 CENTS**

Published monthly at Cooperstown, N. Y., by the Heating and Ventilating Magazine Co.
Executive and Editorial Offices 1123 Broadway, New York

Entered as second-class matter at the Post-Office in Cooperstown, N. Y.
Copyright, 1922, by The Heating and Ventilating Magazine Co.

Send for list of references of school installations and complete data regarding the Spencer equipment.

Spencer Turbine Cleaning Systems

Horizontal slow speed Spencer Turbine vacuum cleaning exhauster. Direct motor driven, wide clearance, multistage type equipment.

particularly developed for the cleaning of school buildings in a sanitary manner without spreading dust in the air, and giving the most thorough and rapid cleaning for school buildings.

Spencer systems are chosen by those who have had the most experience with vacuum cleaning apparatus in school buildings

THE SPENCER TURBINE COMPANY
Hartford, Conn.

JSC

The word *service* in this company's name applies to the installation of the Johnson Pneumatic System of Temperature Regulation by no one other than the Johnson Service Company. It implies the efficient performance of the apparatus following installation. It includes the company's guarantee of attentive interest in the installed apparatus as long as it exists. It embraces the superior benefits derived from The Johnson System, in its various applications: alone unequally advantageous, and especially so with the foregoing comprehensive elements of strict supervision. *Service*, indeed.

The Heating and Ventilating Magazine

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

OCTOBER, 1922

OZONE AND THE CURE OF DISEASE

Typical Treatments of Tuberculosis and Influenza-Pneumonia with Oxidized Compounds and Ozonized Air

BY JAMES TODD

Author of "Experiments with Oxygen on Disease."

A GREAT deal has been written and spoken upon "ozone" which unfortunately has been controversial, and I have been asked to write upon the subject, probably due to the fact that I have given most of my time for the last twenty years to the study of the element oxygen in its different forms.

In meeting this request it is my intention to take considerable license unto myself as I think that if we are to remove the misconceptions surrounding the subject we must approach it in a different way from our predecessors and so I intend to deal with it by first attracting the reader's attention to the tremendous benefits that will come to the human race if we can reach a workable basis for the future development of the field.

THE EFFECT OF "OZONE" ON TUBERCULOSIS.

I place before you the tabulated results of the treatment of a definite case of tuberculosis; the treatment consisted in giving the patient cod liver oil which had been oxidized with "ozone" to a point where it contained about 8% of this intensified form of oxygen.

Will the reader please note that the condition of the patient before the treatment is shown under the heading "Digest of Diagnosis," and that below this come the physician's reports of later examinations?

At the head of the first column is the date at which the examination was made before any of the oxidized compound was used; after this the dates are those upon which the physician examined and reported upon the patient's condition.

The temperature of the normal individual is about 98-2/5° F. This case shows a temperature of 99° to 100½° at the start. When we glance down the column of temperature changes we see that the temperature is strongly forced towards the normal and in the end becomes permanently normal, showing, at the very least interpretation that we can place upon it, that the disease has been restricted.

The normal pulse of the individual is 72. It will be noted that, in this case the pulse was 98 at the start, was never above 90 after the treatment commenced and later became normal at 72.

The normal respiration is 18. Most cases of tuberculosis show a respiration ranging much higher than this, although in this particular case it was 17 at the time of the original examination, which was possibly a chance finding. It will be noted that it ranges for some time between 20 and 24 but at the end of about ten months becomes normal at 18 and remains normal.

From a rather extensive experience with cases of this kind I have found that the characteristic symptoms of the disease

RESULTS OF TREATMENT OF TUBERCULOSIS WITH OZONIZED COD LIVER OIL.

Dates.	Weight.	Respiration.	Pulse.	Temperature.	Appetite.	Dose: Drops. In 24 Hours.	Treatment Started: Nov. 25, 1917. Treatment Stopped: Jan. 1, 1919
				Digest of the Diagnosis.			
11-25-17	130	17	98	99.0 to 100.5	Good	30	Patient has night sweats, slight cough and expectoration; also chills and slight digestive disturbances. Increased vocal resonance. Loss of weight.
				Data from Physician's Written Reports During Treatment			Digest of the Physician's Written Reports During Treatment.
12-29-17	135	20	90	98.4	Very good	90	Very much improved; no expectoration but slight cough. Digestion very good.
1-31-18	137½	24	84	99.2	Good	180	Condition improved. Rise in temperature is no doubt due to an attack of laryngitis. Patient working outside daily.
2-18-18	134	24	90	99.0	Good	210	General condition good.
3- 5-18	133	22	72	98.2	Good	210	Patient is working and feels good.
3-23-18	131½	22	85	98.3	Good	240	Has lost some weight but feels good; has good appetite and is working steadily.
4- 6-18	132	20	82	99.0	Good	240	General condition fair. Patient is working steadily.
4-23-18	133	24	82	99.0	Good	240	Patient feeling good and working every day. Took an active part in a dance on April 20th.
5- 8-18	133	22	84	98.4	Good	240	General condition fair. Working steadily.
5-23-18	130	24	80	99.4	Fair	240	Same as previously reported.
6- 9-18	130	20	72	98.2	Good	240	General condition good.
6-24-18	130½	22	88	98.2	Good	320	General condition good; working daily.
7- 8-18	130½	22	90	98.3	Good	360	General condition good.
7-22-18	133	24	84	98.2	Good	480	No change in symptoms. General condition good.
8- 9-18	133	24	86	98.2	Good	480	No change in symptoms. General condition good.
8-23-18	133	24	84	98.2	Good	480	No change in symptoms. General condition good.
9- 9-18	137	24	82	98.3	Good	270	Patient's appetite failed and he became sick at the stomach. Stopped Ozonate for a week and then resumed and he is now doing fine. General condition good.
9-24-18	137	18	72	98.3	Good	360	General condition good.
10- 7-18	133	24	86	98.2	Good	360	Has slight cold, but working steadily.
12-13-18	135	18	80	98.4	Good	180	No change in symptoms.
12-23-18	135	18	72	98.2	Good	180	No change in symptoms.
1-20-19	135	18	72	98.3	——	180	General condition good. Has had a cold but continued working regularly.

are shown by the heart rate, respiration and temperature being above normal, and so the patient is exposed not only to the ravages of the disease but to the drain upon his strength caused by these coincidental factors.

It is also generally conceded that tuberculosis is a wasting disease evidenced by a more or less serious loss in weight, the extent of the weight loss being apparently dependent upon the rapidity and extent of the attack.

This man weighed 130 lbs. when he came into my hands and while there was not a very heavy increase in weight, yet there was no loss and it should be noted, in considering this factor, that the man returned to his duty in a coal works very shortly after the treatment commenced and worked throughout the whole period of treatment.

The treatment commenced on November 25, 1917, and was discontinued on January 1, 1919. About two years later the letter published was received from his physician showing the man to be absolutely normal with no trace of the disease in the lungs, and that he had gained 12 lbs. in weight and the physician states that he is a well man.

This startling result, which means nothing more or less than that the cure of tuberculosis was brought about entirely by the proper use of that which is generally called ozone removes the question from a controversial plane to the higher one of a great good thing for humanity as there are probably a million cases of tuberculosis in our country today.

In passing I would say that I have a number of such cases and that I have not chosen my clearest and best one for this demonstration.

"December 7, 1920"

"My dear Mr. Todd:

"Physical examination of L.... R.... shows Pulse 72, Respiration 18, Temperature 98.3° F., Lungs negative. Has gained 12 pounds in weight since illness, is working every day, had had no illness since last treated with Ozonate, no cough or expectoration, in fact enjoys life a well man.

"(Signed)....., M. D."

MEETING GERM DISEASES WITH ONE DOMINANT FORCE.

We are all accustomed to the thought that we have to deal with each disease as a separate problem but Nature does not tell us so. Nature says, to my mind at least, that she is capable of meeting germ diseases by one dominating force; that that force is the element oxygen and that it must be intensified before it is used in order to overcome the condition which we express as normality.

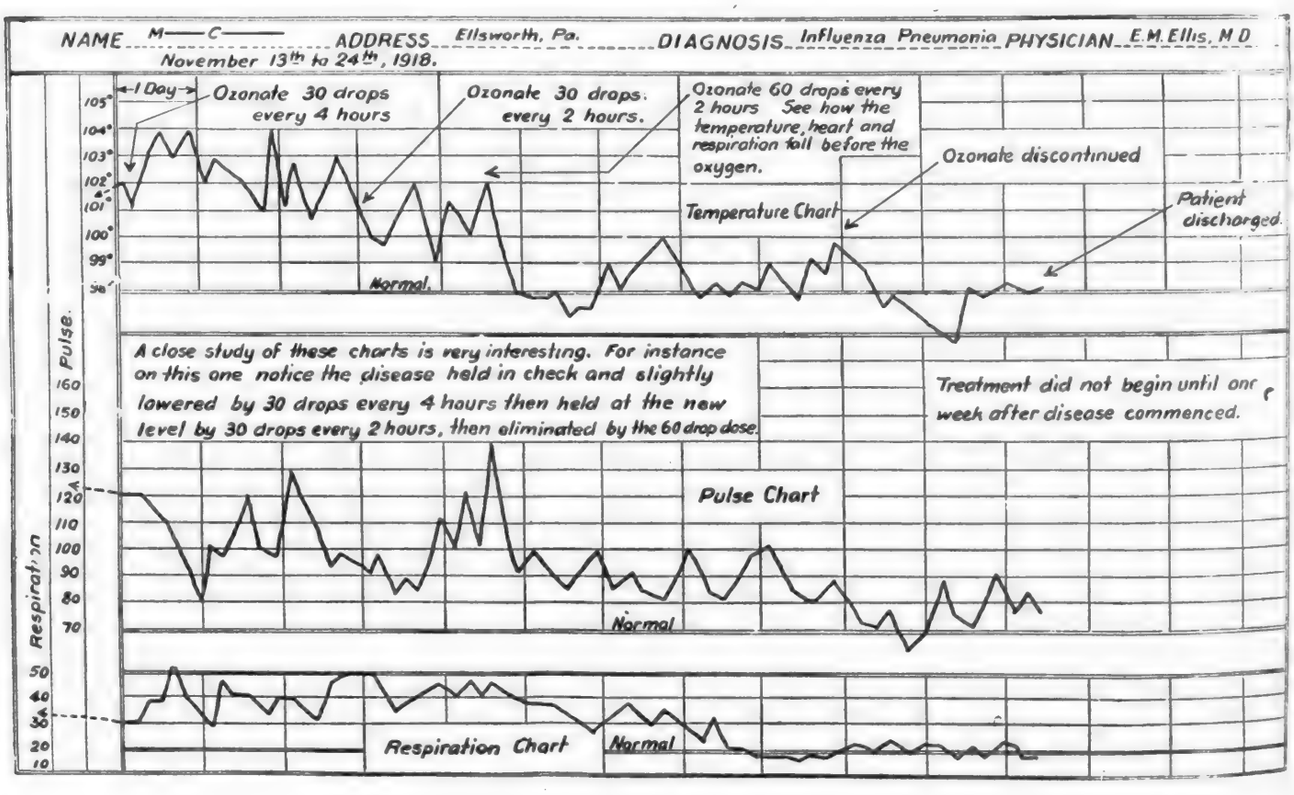
In explanation of this statement let me say this: Nature has made the conditions surrounding us the best for the maintenance of health in the great majority but when the unfortunate one is stricken by a germ disease he passes out of this class and becomes a problem—in fact the greatest material problem that the human race has to face—and we cannot expect to reach his case by oxidation unless we take one of two courses.

1. It would be possible to increase his power to absorb and utilize oxygen. However, as this is not the phase of the question with which we are dealing, I will pass it by without comment.

2. Instead of intensifying the individual's power to take oxygen the simpler problem is to intensify the oxygen so as to make it more active, and thus enable us to reach, as it were, his vital processes and tune them up. This I have undertaken to do by the combination of oxygen with an edible oil, using, not the normal forms of oxygen, as they could hardly attain my purpose but the intensified ones which go under the general name of "ozones."

Now, if we may at our will and in a controlled form, introduce a vital or intensified form of oxygen into the body processes, and, if oxygen is the force that Nature primarily relies upon for the purpose of opposing germ diseases as a class, we will not be restricted in our demonstrations to any one germ or type of germs but will probably have a broad field to cultivate.

This fact having been established in connection with my work, I shall now turn from tuberculosis to that fearfully fatal epidemic which passed over this country in 1917, and place before you a case of influenza-pneumonia.


NAME M—— C—— ADDRESS Ellsworth, Pa. DIAGNOSIS Influenza Pneumonia PHYSICIAN E.M.Ellis, M.D
November 13th to 24th, 1918.
1 Day
Ozonate 30 drops every 4 hours
Ozonate 30 drops every 2 hours.
Ozonate 60 drops every 2 hours See how the temperature, heart and respiration fall before the oxygen.
Ozonate discontinued
Patient discharged
Temperature Chart
Normal.
A close study of these charts is very interesting. For instance on this one notice the disease held in check and slightly lowered by 30 drops every 4 hours then held at the new level by 30 drops every 2 hours, then eliminated by the 60 drop dose.
Treatment did not begin until one week after disease commenced.
Pulse.
Respiration
Pulse Chart
Normal
Respiration Chart
Normal

RECORD OF INFLUENZA PNEUMONIA CASE TREATED WITH OZONIZED COD LIVER OIL

TREATMENT OF INFLUENZA-PNEUMONIA CASE.

This case was treated with the same material that was used in the case of tuberculosis, but the oxidized oil was used in much larger quantities, and, as we had a quick-acting germ, the results came not in months but almost in hours.

In order to appreciate the importance of this case, which I give to you entirely in the form of a medical chart, I will ask you to note that the top division is the temperature, the middle division the pulse and the lower division the respiration and that each longitudinal division is one day and that the examinations were made once every four hours.

With this explanation I would ask you to study this chart very closely for the question is an extremely important one. Note that the temperature at the highest was 104,° the pulse 140 and the respiration about 50, thus showing a very serious condition of affairs with death as the probable end.

If you will follow, by means of the indicating arrows, the dosage used you will see a light dose at the first controlling the disease to a certain extent and gradually forcing it to a lower level but not in any sense eliminating it.

On the fourth day the dose is doubled as there has been no real improvement in the previous three days, still we do not attain an effective dose although we create some betterment, but on the fifth day from the start the dose is again doubled, sixty drops in two hours being equal to four times the original does of thirty drops in four hours, and here we reach the climax.

Glance down this chart, see the temperature drop radically and positively to the normal, see the heart action drop in a few hour's time from 140 to almost 90 and the respiration strongly forced towards the normal.

In four days the treatment is discontinued and two days later the patient is discharged and is living today.

I am writing to ventilating engineers, and their first impression will probably be that I am giving them a lecture on medicine, but I am not trying to do anything of the kind.

The question of human life can well be set up above the question of ventilation, but at the present time I am simply attracting your attention to the fact that tuberculosis and pneumonia have been cured before your eyes by that which you call ozone, and if it will accomplish such radical results it must hold, when properly used, a wonderful future in ventilation because ventilation is primarily for the purpose of maintaining and raising the health standards.

I would again state, as I did in speaking of the case of tuberculosis, that I have not by any means chosen my best case of pneumonia as I always like to keep the best for future reference in case you come to me in regard to this matter; my present effort is restricted solely to a wish to give you plain evidence on an important question.

TREATMENT OF ANIMALS WITH OZONIZED AIR.

I shall now place a third demonstration before you. This one, however, is not of human beings but of animals and is given to you because the animals were allowed to breathe the so-called ozone, thus showing that the results are not attributable in any way to the cod liver oil, which I only used as a carrier for the oxygen.

The drawing I give you is very simple; it covers the life record of 137 guinea pigs all of which were inoculated, under identical conditions, with the tubercle bacilli. The question placed before you is solely the effect of the intensified oxygen upon the life of a guinea pig which has been inoculated with the tubercle bacilli.

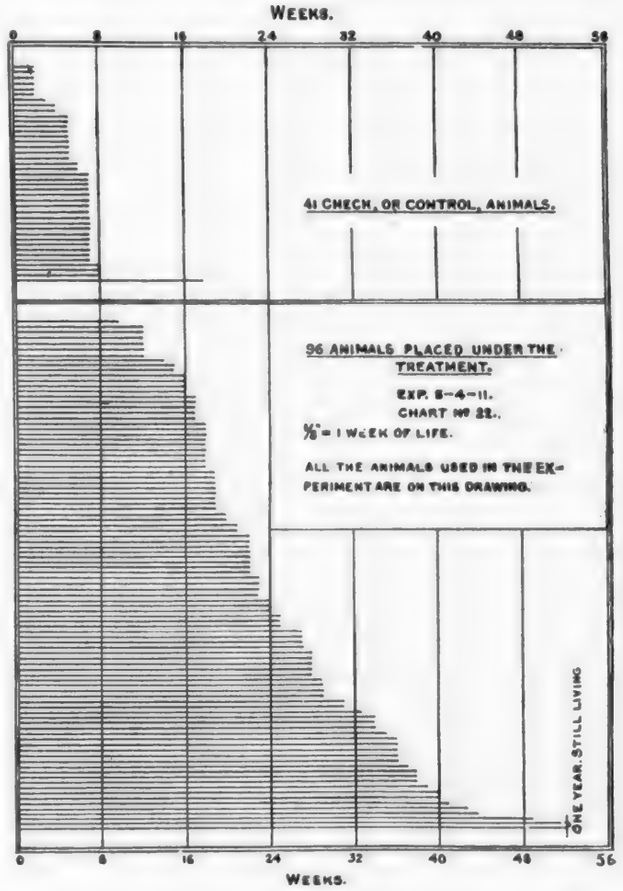
The straight horizontal lines on the drawing represent the life of each animal, commencing with the ones which died in the shortest time.

In the upper division of the drawing are placed the life lines of 41 check animals, by which I mean those animals which were inoculated identically with the others and kept on the same food and under the same conditions *excepting that they were not given any of the oxygen gases to breathe.*

From much work that I have done in this line I would say that the general life of a guinea pig which has been heavily inoculated with the tubercle bacilli ranges from one or two weeks, to seven or eight weeks; at the end of the latter period the internal organs being almost destroyed by the germs.

By following the life lines of the check animals in this upper division it will be noted that the first one died in two weeks and at the end of eight weeks all but one were dead.

Now pass to the lower division and you are met with the cold fact, for fact it is, that the first animal to die instead of living but two weeks lived eleven weeks and that the life lines there stretch out in startling demonstration of the proper use of intensified oxygen until you find some of them still living at the end of one year.



LENGTH OF LIFE BY WEEKS OF 41 GUINEA PIGS AS COMPARED TO 96 GUINEA PIGS PLACED UNDER OXYGEN TREATMENT, ALL INOCULATED WITH THE TUBERCLE BACILLI.

I have stated that I intended to attack this problem from a new angle, and to accomplish this purpose I have shown you the cure of tuberculosis in the human being, to which I add the cure of influenza-pneumonia in the human being, both being accomplished by the use of oils oxidized with so-called ozone, and to these I have now added the record of 137 animals, comparing 96 which breathed air containing ozone to 41 which did not have that experience.

I have already stated that I have many more cases both of tuberculosis and pneumonia similar to or better than the ones I have given you, but I have now submerged the fact in the record of more than 100 animals and established the intensified oxygen as the vital principle, taking this course for the purpose of trying to impress upon you the great importance of the proper development, not only of these questions of the treatment of disease, but also those involved in proper ventilation for the main-

tenance of health and the consequent prevention of our being compelled to reach out for those who have fallen by the way.

THE STRANGE POWER OF OZONE.

A thing is never complicated to those who understand it, but the mental effort required to enable one man to understand the work of another is often the last thing that that man will give.

I do not wish it inferred from the above statement that I am able to give you an explanation that will be satisfying to all of you, or even an explanation that is to any extent comprehensive of what this strange power to which you have applied the name "ozone" is, but I can dispose of some of the errors which have crept into the situation and which are mainly present because they have been put there by those who did not understand the problem with which they were dealing.

In order to maintain clarity and brevity I will deal with these questions under separate headings, restricting myself entirely to facts which I am able to demonstrate.

DOES OZONE EXIST FREE IN THE ATMOSPHERE?

The answer to this question is very definitely "no." This answer is based both upon the knowledge of the fragile character of the gas and upon experimental data.

Ozone does not exist in the atmosphere any longer than it takes it to come into contact with some oxidizable organic matter, a leaf, a flower, the human body, or any of the thousands of other things. If you wish to demonstrate this to your own satisfaction, blow ozonized air slowly through a glass vessel into which you have inserted some leaves, flowers, grass, cotton, a piece of meat, or any oxidizable organic matter and you will find that your gas is destroyed, it having returned to the normal form of oxygen as it acted upon the organic material used.

If you choose to make such a test, the only restriction you have to make is to pass the ozone through slowly enough to be sure that it has time to come into contact with the organic matter; also bear in mind that if you pass the ozone through for a sufficiently long time that you will oxidize all the organic matter and from that time on the gas will cease to be destroyed.

CAN TOO MUCH OZONIZED AIR BE USED AND CAN TOO LITTLE BE USED?

The space which I am given in this article will not permit of my placing experimental data before you on this question, so I will restrict myself to simply stating that I have demonstrated that 4% of ozonized air mixed with 96% of ordinary atmospheric air will invariably kill a guinea pig.

On the reverse of this question, the fact that we can use too little will appeal to common sense and the present method of guessing, or assuming, the amount of ozonized air that is present in a room must be abandoned and replaced by definite knowledge, which, by the way, is easy to attain before uniformly good results will be attained.

The writer's judgment is that for public building and school ventilation work about one-half of 1% of ozonized air, in which we know and maintain the content of the intensified oxygen, should be used, as below this percentage the results would be vague and untrustworthy, and above it they might become dangerous to life, as it must always be borne in mind that they are carried down into the deepest recesses of the lungs in their passage into the body.

These statements do not apply to the treatment of those suffering from serious germ attacks as they require much more of the gas.

IS THE PROPER USE OF OZONE BENEFICIAL?

To the writer's mind the experimental data which he has given on both the human being and the animal answers this question in the affirmative and argument would be superfluous.

WHAT IS SO-CALLED OZONE?

I have worked with it for twenty years. I am not in a position to say positively what it is, but I do know that it contains the greatest problem in modern chemistry and is not in any sense the simple thing that it is generally presumed to be, and the trend of my work leads me to the opinion that there are many different forms of what you call ozone, made by different mechanical, electrical or heat treatments.

The literature on the subject is peculiarly misleading as we really stand without any absolute proof that even oxygen is the only essential of ozone. It almost undoubtedly is, but all that has been written shows no evidence of ozone ever having been made from oxygen that was known to be free from contamination with any other element.

In the early days we were given a beautiful theory which was said to compass the whole problem, namely that three atoms of oxygen were concentrated into the space formerly occupied by two, but in the present day the information in regard to the different forms of an element and especially in regard to the electronic balance of an element and the fact that we use the electric current in the making of the gas all speak against such a view.

My own work shows to the student, in a fairly clear way, that there are probably at least three different classes of intensified forms of oxygen but in this space I cannot go into this question.

Oxygen, holding as it does the great gift to the human race of the power to control their bodies from the ravages of germ diseases, deserves an attention that has never been paid to it. I have tried to study it back to what I conceived to be Nature's plan in the creation and maintenance of organic life and have, by deductive reasoning from this foundation, been able to forecast a great deal and to practically demonstrate many facts of startling importance.

To those who are sufficiently interested I would say that I will be very glad to take up as far as possible any questions that they may wish to bring to my attention.

The pith of the matter is that we must appreciate what normality in Nature means, and to this must be added the wonderfully beautiful controlling hand that guides Nature's work from creation to attainment, and this can only be accomplished by setting aside our old ideas and prejudices and facing with concentrated common sense the facts by which we are surrounded; always bearing in mind that just knowing a thing, as you know what I have here written, does not in any sense take the place of an actual realization of the importance of this tremendous field, which, while it covers the questions of the ventilating engineer, also contains the solution of the greatest material problem with which man is faced. So please bear in mind that which I now for the second time state, that a thing is never complicated to the one who understands it, and try to understand.

Fuel Economy in the District of Columbia.

At the request of the Director of the Budget, the Bureau of Mines is conducting a fuel economy survey to investigate the conditions under which fuel is used in the various Government fuel-using plants in the District of Columbia, and to determine what economies, if any, can be made in the use of such fuel. M. A. Mumford, assistant fuel engineer, of the Pittsburgh Experiment Station, has been detailed to this work for a period of one year.

CONTRACTS TO INSTALL HEATING EQUIPMENT

Legal Points Concerning Rights and Liabilities Which Have Caused Litigation

BY A. L. H. STREET.

ALONG the coast of the Law are to be found numerous lighthouses which may serve as safe guides to the heating engineer or contractor who is "at sea" concerning rights and liabilities under a contract for the installation of heating apparatus. The warning they give should serve to keep one off the jagged rocks of Litigation, as well as to point the way to clear sailing. These lighthouses are decisions of courts of high authority in cases where rights under such contracts have been litigated.

From one of these decisions we deduce the moral: A dollar spent in careful performance of a contract may save twenty in lawyers' fees and court costs. It is a decision of the Iowa Supreme Court. (143 Iowa Reports, 744; 120 Northwestern Reporter, 921.)

Defendant contracted to install a heating plant in plaintiff's dwelling house. The contract included these clauses:

"This heater, when properly set and connected to a good flue of proper size and of a sufficient height, not to be affected by adverse winds, will be capable of burning the soot out so clean that it will not clog up the fire surfaces so as to have to be scraped or cleaned out, even when using common Iowa soft, unscreened coal. We guarantee the boilers and radiators of sufficient capacity to heat the above-described rooms to a comfortable degree of temperature in the coldest winter weather by the proper firing and handling of the plant."

On completion of the installation, plaintiff paid the contract price, but later sued for damages, claiming that there was a breach of the above quoted warranty. The court affirmed judgment in her favor.

It was found from the evidence in the case that failure of the plant to properly heat the house was due to improper installation, and not to improper firing, etc. The defects consisted in improper union of pipes, in attaching the outgoing pipe to the bottom of the boiler, instead of the top, and in construction of an expansion tank. The Supreme Court said:

"Counsel seem to think that if defendant furnished a boiler sufficient in size and proper radiators to heat the house this was all that was required, although the boiler and radiators as joined together and constructed would not furnish any heat; but this is not a proper construction of the guaranty. If the proposition were true, defendant might place the boiler in the cellar and the radiators in the rooms and contend that it had complied with its warranty. The boiler capacity and radiation referred to was a boiler and sufficient radiators which, when constructed and joined together, would produce the results promised. . . . 'Radiation' means something more than radiators. Radiation refers to heating capacity of the radiators when connected up with the boiler."

EFFECT OF CHANGE IN PLANS.

From another decision we draw Moral No. 2: When a modification in plans will impair the ability of a plant to heat a building, as guaranteed under the original plans, a modification of the guaranty should be insisted upon. We refer to the decision of the Illinois Appellate Court, as summarized at page 437 of volume 185 of the reports of that court. In the case before the court plaintiff sued for damages for breach of a warranty that a heating plant installed by defendant, a general contractor, through a subcontractor would heat plaintiff's house to 70° F. in zero weather. It was decided that the contractor was liable on his guaranty, although the owner directed him to place seats over the radiators, the contract expressly providing that the owner might require changes in the construction of the house. The court takes the view that if the owner ordered such changes as would prevent the heating plant from fulfilling the warranty, the contractor should not have proceeded with these changes and installation of the plant, without requiring an appropriate modification of the guaranty.

In the same case it is decided that an owner's acceptance from a sub-contractor of a guaranty of the capacity of a heating plant installed by the latter does not release the general contractor's liability on a guaranty made by him.

SUFFICIENCY OF CONTRACT PERFORMANCE.

Other decisions remind us of the settled principle of law that where a heating contractor has attempted in good faith to perform his contract and has substantially performed it, he is entitled to recover the contract price, less a fair allowance to the owner for any expense involved in making the work conform strictly to the contract requirements. Substantial performance is, also, usually required to entitle the contractor to enforce a mechanic's lien.

These last-stated principles were recognized by the Illinois Appellate Court in a case involving installation of a heating plant. (167 Illinois Appellate Court Reports, 553.) There it was decided that a contract had been substantially performed. But right of another heating contractor to recover was denied by the South Dakota Supreme Court for reasons stated as follows:

"The [trial] court found that there had been a substantial performance of the contract, and yet found that it would require an addition of 300 sq. ft. of radiation to make the heating plant comply therewith. To us, these findings appear inconsistent. With the heating plant so deficient, we can hardly see wherein the trial court was justified in finding that there had been a substantial compliance with the terms of such contract." (146 Northwestern Reporter, 570.)

The plant involved in the last cited case was installed in a theatre building in a South Dakota town.

SUFFICIENCY OF CONTRACT SPECIFICATIONS.

It is not possible to make a litigation-proof contract. All that can be done is to use particular care to see that agreements are reduced to writing, and to make them as clear and full as is reasonably possible. This caution should be specially used in the making of agreements which modify or supplement some pre-existing agreement. The law reports contain numerous cases showing that a few scratches of a pen would have saved a long drawn-out and expensive lawsuit. I cite three illustrative cases.

Plaintiff contracted to install a steam heating plant for defendants, and in performing the work furnished some patent valves on the risers, on the order of the owner's supervising architect. Defendants admitted authorizing the architect to place the order, but when sued for the value of the valves they resisted liability on the ground that they understood that these appliances were covered by the main contract. Deciding the controversy in plaintiff's favor, the Appellate Division of the

New York Supreme Court said (125 New York Supplement, 1010):

"The undisputed proof is that no provision was made for the installation of these valves in the original contract between the plaintiff and the defendants. Therefore, the work, if ordered by the defendants, was extra work unquestionably. At the trial the defendants gave evidence tending to show that they had requested their architect to make provision for these valves in the original contract; but as no such provision was made in the original contract, the defendants cannot defeat the right of the plaintiff to recover for work and materials furnished by their order simply because their architect had omitted to follow out their wishes in the preparation of his plans and specifications for work done under the original contract."

Failure to attach plans and specifications to a contract to install another steam-heating plant resulted in litigation which went to the Appellate Term of the New York Supreme Court (104 New York Supplement, 431.) In that case it appeared that the contract referred to a drawing and specifications identified by the signatures of the parties. But the papers, having been mislaid by the owner's superintendent, were not so identified. And later when the owner furnished a set the contractor insisted that it was not that upon which he had bid, and refused to proceed under them. The owner sued for damages, but the court ruled in favor of the contractor. It was decided that under the circumstances the contractor was entitled to prove by extraneous evidence that the specifications so furnished him were not those in mind when the contract was made.

In a case before the Michigan Supreme Court (133 Northwestern Reporter, 921), plaintiff sued to recover for covering steam pipes under a church building in Detroit. It seems that there was a separate boiler house, and the contract required "pipes underground" to be covered. The court sustained a claim on the part of the contractor that the contract did not require covering of pipes under the church but not under ground. It was also decided that the owner was not entitled to show verbal negotiations between the parties before the written contract was entered into, tending to show an understanding that the pipes under the church were to be covered; but that the contractor was entitled to show that after the contract was entered into and when the question of covering the pipes arose, the work was done on a verbal agreement with the architect that it should constitute an extra. Drawing a distinction between these verbal negotiations according to whether they occurred before or after the original contract was entered into, the court says:

"We understand the rule of law to be that prior mutual understandings of the parties are unimportant, when they have signed a contract covering the subject-matter, since the latter covers all such prior negotiations and agreements. . . . The general rule is that you cannot import into a written agreement a prior parol agreement which alters the terms or legal effect of the written agreement.

"We think that the plaintiff was entitled to have fully submitted to the jury his claim, to wit, that, by a subsequent oral contract with the architect and the defendant, he was authorized to cover the pipes and charge for the same as an extra."

HEATING AND VENTILATING THE EARTH

A Conception of the Vast Air Movements and Heat Exchanges Throughout the World Which Mark the Hand of the Master Engineer

BY G. J. O'CONNOR,
Observer, United States Weather Bureau.

ONCE, when the writer visited Washington City, he went like most other sightseers to the great Washington monument. It was in February. The several days preceding had been cold, but the morning of his visit was warm and sunshiny. On entering the door at the base of the monument a strong blast of cold air was blowing out. Upon inquiry of the attendant it was learned that this was a common occurrence. It was nature's own method of ventilating a shaft 555 ft. high. The stones of the monument had become chilled in the colder weather of the days preceding, and all the air within the shaft was cooled, thereby becoming so heavy that when the door was opened at the bottom, it descended swiftly and blew out with some violence.

Later in the day he visited the Central Office of the United States Weather Bureau. Upon relating his experience at the monument, Prof. Charles F. Marvin, in an impromptu interview, impressed upon the writer this fundamental principle in the cause of wind. "The downward pressure of the air illustrates," said he, "the movement of air currents in the development of the cyclone or whirl in the air."

WHY THE WIND BLOWS.

The wind blows because the air is colder and therefore heavier in one region than it is in another; the cold heavy air flows along the surface of the earth, creeping under the warmer, lighter air; the flowing air is wind. When the warmer air becomes superheated, it acquires an ascending movement; a vacuum is generated; a hole is made in the aerial ocean; the colder, heavier air presses downward and inward to fill up the space occupied by the expanded air. In this way circulation is started. A very deep depression in the atmosphere may thus be formed. This is called a cyclone or more commonly a storm center.

If the atmosphere in the north and south were equally cold and heavy, it would be calm everywhere; if it were all warm and light, it would be still and motionless. But since there are always differences of temperature between different regions, so there must always be winds blowing from one place to another. Far away on the northwest plains, beyond the Saskatchewan, the winters are very cold. The days are short, the sun rising but little above the southern horizon and shining only faintly on the snow-covered ground. The snow reflects away much of the sunshine that falls on it, and the reflected rays give no warmth to the earth. The nights are long and quiet, allowing the snow to become exceedingly cold, and thus cooling the air that lies on it. The whole region becomes surcharged with cold, heavy air.

If it were surrounded by mountains, this cold air might remain there, but little disturbed, until warmed again by the lengthening sunshine in Spring. The Rocky Mountains are on the west, but there is no such geographical inclosure on the south and east. The rotary motion of the earth on its axis, and other physiographical causes of circulation, give the atmosphere its general eastward trend. The plains stretch without interruption across the international boundary, thus permitting the heavy air to sweep out from the region of greatest cold

toward a region where the air is warmer and more depressed.

EXTREMES OF SUMMER HEAT AND WINTER COLD.

The following table was prepared from the records of the U. S. Weather Bureau. It shows the extremes of summer heat and winter cold, and the wide range between them, at the designated stations.

Station	Highest temperature of record deg. F	Lowest temperature of record deg. F	Station Range. deg. F
Boston	102	—13	115
New York City	102	—13	115
Pittsburgh	103	—20	123
Washington	106	—15	121
Atlanta	100	— 8	108
Jacksonville	104	10	94
Key West	100	40	60
St. Paul	101	—40	141
Chicago	103	—23	126
Cleveland	99	—17	116
St. Louis	107	—22	129
Louisville	107	—20	127
New Orleans	102	7	95
San Antonio	107	4	103
Miles City, Montana	111	—65	176
Salt Lake City	102	—20	122
Denver	105	—29	134
Seattle	96	3	93
San Francisco	100	29	71
Los Angeles	109	28	81
Phoenix, Arizona	119	12	107

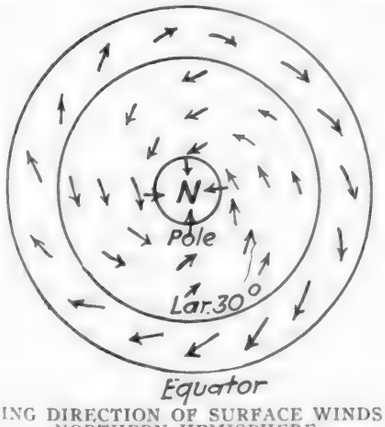
From the figures in this table, it is apparent that in the winter home of cold waves, a temperature is sometimes recorded in summer considerably above the highest ever experienced in the "Sunny South." Strange it is but true that a daily maximum of 95° F is rarely attained on the Peninsula of Florida.

WHY IT IS COOLER ON THE WATER IN SUMMER.

In the summer the direct rays of sunshine warm the land more than the water. Thus the air all over the land attains a higher temperature than that over the oceans. Water evaporates and much of the sunshine that falls on the sea is given over to supplying the energy needed for evaporation, or latent heat. Hence, less sunshine is devoted to causing a rise in temperature at sea. The land is non-volatile. All the sunshine that falls on it is devoted to warming it, except the little required to dissipate the morning dew or the preceding night's rain.

Water is transparent; hence the sunshine enters to a considerable depth in the ocean and distributes its warming action through a large volume of water. The land is opaque and takes all the sunshine that falls upon it directly at the surface, thus warming only a thin layer. Water may be said to be a difficult substance to warm, because its specific heat is high; but land warms easily because its specific heat is low. These are reasons which account for the difference of temperature on close summer days between land and water, and thus between the air over the land and over the water.

The lands are warmer than the seas by day and colder by night. So, too, the land is warmer in the summer, as a whole, and colder in the winter. During the warm season, the winds tend to blow from the ocean to the continent; in the colder months, from continent to ocean.



PREVAILING DIRECTION OF SURFACE WINDS IN THE NORTHERN HEMISPHERE.

Southward of 30° N. the direction is northeast, becoming east near the equator. In the temperate and frigid zones the prevailing winds are westerly.

THE GREAT SYSTEMS OF AIR CURRENTS.

From the atmospherical and physiographical conditions we are enabled to comprehend even greater and more complete systems of air currents. With the Pole as a center, there is in the northern hemisphere, generally speaking, a whirling movement of the atmosphere from west to east around the globe. (In the southern hemisphere, this whirling circulation is from east to west.) As the cold air advances southward through a milder climate, it gradually becomes warmed. There is yet much to be learned about the manner in which the warm air from the equatorial regions is conveyed northward. Sea captains are daily bringing into American ports records of daily Greenwich noon-time observations made by them on the high seas which they have traveled. These observations are immediately forwarded to the Washington office where they are valuable in completing the daily weather chart of atmospheric conditions around the globe. These, in turn, enable the meteorologists to establish normal conditions for each month of the year for sections of the ocean bounded by certain parallels of latitude and certain meridians of longitude. Outgoing captains are thus provided with seasonal charts which inform them regarding the winds and weather they may expect to encounter on their contemplated trip. But there are vast areas of land yet uninhabited, from which records of systematic observations are not available.

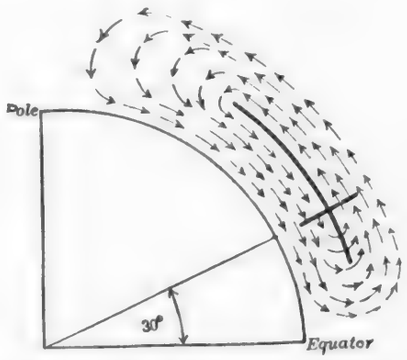


FIG. 2.—SUPPOSED NORTHERLY AIR CURRENTS ALONG THE EARTH'S SURFACE AND RETURN SOUTHERLY CURRENTS IN UPPER ATMOSPHERE.

THEORY OF AIR FLOW FROM EQUATOR TO POLES.

For many years it was commonly believed that the heavy air currents from the Poles, upon arriving near the equator, raised the warm, light air on its back, so to speak. The equatorial current then pursued its course in higher altitudes toward the Frigid Zone and the Pole, in the manner described in Fig. 2.

But this theory of primary circulation, if not entirely abandoned, has been greatly modified. "For," say the modern meteorologists of the Weather Bureau, "it is indeed true that

the trade winds, as they approach the equator, ascend and gradually flow off poleward, thus producing an overflow or anti-trade branch of the circulation; they become the general westerlies of the higher latitudes. These, in their turn become dissipated by storms and other local circumstances; but after a few or many vicissitudes, ultimately return to a somewhat similar starting point. (See Fig. 1.) Thus the circulation is perpetual, in which any round from lower to higher latitudes and return is similar to, but, in general, by no means a duplicate of any other. There is a general similarity in these cycles of circulation, just as one tree is similar to another; but they present, as do the trees, an endless variety of detail."

METHODS OF OBSERVING UPPER AIR CURRENTS.

In addition to the advantages derived from observations made by mariners at sea, Professor Marvin, chief of the Weather Bureau, has established means whereby, at many stations well distributed throughout the United States, observations of upper air currents may be obtained by kites and balloons flying to elevations of 10,000 feet and higher.

The kites and balloons are held captive at certain elevations. Self-recording instruments taken upon them bring back records which furthur refute the idea of a constant northward upper current. Experiments with similar instruments are made by aeronautists in their daily ascent in aeroplanes at a number of stations widely distributed over this continent.

Weather Bureau forecasters in their daily study of whirls or vertical movements of air are constantly finding reasons for modifying theories of former times. Cyclones and hurricanes, they maintain, are elements of disturbance by secondary atmospheric circulation. Air motions of this type, like the local thunderstorm, have a beginning and an end. But, whatever the cause, it is certain that the hemispherical circulation never stops. By means of it and other physical causes mentioned above, the atmosphere is kept well mixed. These various air motions from land to water, day and night, winter and summer, year in and out, from the poles to the equator, back and forth and around the globe, constitute indeed a magnificent system of heating and ventilating the Earth in the literal sense of the words.

A subsequent article will describe the cyclone, anti-cyclone, tornado, hurricane and monsoon, and characteristics of each.

A STUDY IN DEPARTMENT STORE VENTILATION

Novel Methods Proposed for Eliminating Dust and Providing for Proper Air Diffusion

BY J. M. ROBB.

THE purpose of this study is to indicate the practical application to department store conditions, of certain principles in ventilation. It is based on the conviction that some of the principles of mechanical ventilation as now generally practised, are not based on a correct conception.

The end of all ventilation of enclosed spaces is the maintenance of the best and most vigorous state of health of the occupants, by such a relation of air movement, temperature, and humidity as will secure the greatest comfort, with the elimination from the air of all dirt and impurities, bacteriological and otherwise, without depleting the air of any of that quality which the out-door air of uninhabited spaces has for the insurance of the best and most vigorous state of health.

VACUUM CLEANING DUST BAGS AS AIR CLEANERS.

The dust bag of the domestic vacuum cleaner in such wide use, seems to offer possibilities for successful cleaning of air in mechanical ventilation. They are inexpensive to apply; may be readily and quickly changed and it would seem as if their use might eliminate most of the objections to air washers. It must be understood, however, that such bag filters must have the same attention that is given to the maintenance of clean linen in the toilet rooms of well-conducted hotels, that is, they must be changed as frequently as they become soiled; daily if necessary.

INCREASED AIR FLOW FOR SUMMER COOLING.

The wide variation between winter and summer temperatures, requires effective consideration. Theater experience seems to warrant the conclusion that the most effective cooling in summer can be secured by increasing volume of air flow, without attempting to drop its temperature. Such treatment makes for greater comfort at much lower cost than reducing the air temperatures.

WINTER OPERATION AND RECIRCULATION.

Winter operation seems to be most satisfactorily handled by recirculating as much air as possible, both from the view point of cleanliness and that of warming costs.

MOVEMENT OF AIR TOWARDS WINDOWS AND COLD WALLS ADVOCATED.

Consideration of the dirt carried by out-door air, particularly in winter, as well as the irritating annoyance of cold drafts, seems to demand the constant movement of air from center of the space to be warmed, towards the windows and cold walls so that all leakage of cold air with its dirt, will be immediately moved to the cleaning and warming centers.

If this provision is properly employed, the desired room temperature will be maintained by the instant whisking into ducts, of all air cooled by heat losses. The greatest temperature of the air supplied therefore will be that of the room, the drop in temperature, due to heat losses, occurring in the ducts or other passages. The economy of this, as well as the elimination of the cold draft bugbear will be apparent.

WOULD LIMIT AIR DUCTS TO RECIRCULATING WORK.

Duct work is expensive. Ducts with uncleanable surfaces are a greater menace than they are a benefit. They are unsanitary from every view point. Visibility insures cleanliness. Therefore as little duct work as possible should be permitted in ventilation. And what is used should return the air only from spaces to be treated to the cleaning and warming centers, so that all dirt and foreign matter picked up by the air will be held in the cleaning facilities. The natural divisions of the building, so far as conditions will permit, should be freely used to carry the air supplied for ventilation as it flows through the space surrounding the building.

THE PROMISE IN THE USE OF OZONE.

Evidence accumulates that ozone is that lifegiving element of the out-of-door air that is destroyed in ever-increasing amounts by community activities. The artificial supply of ozone therefore, seems only a mechanical restoration of what has been

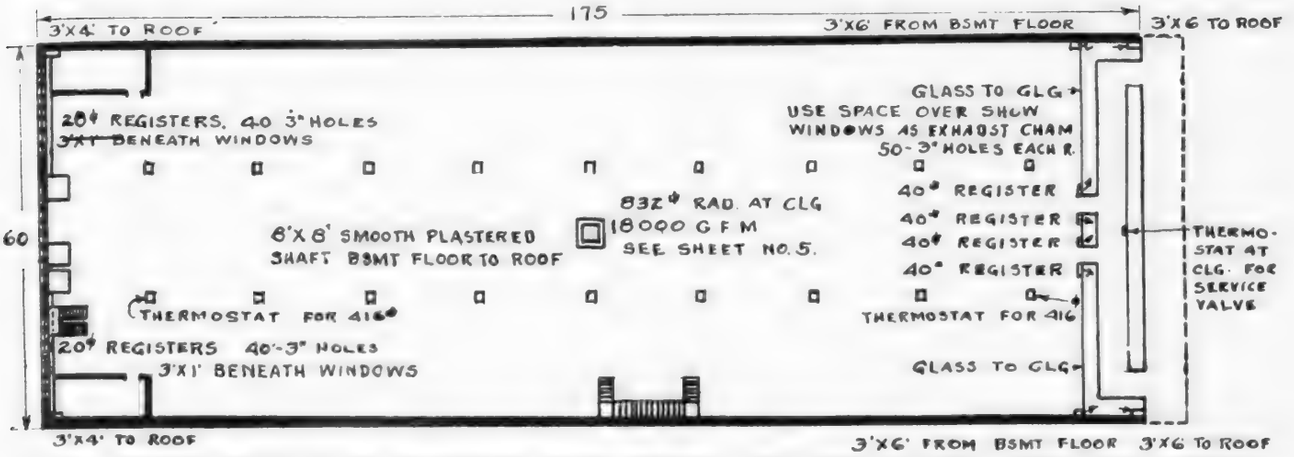


FIG. 1.—FIRST FLOOR PLAN OF DEPARTMENT STORE SHOWING APPLICATION OF NOVEL VENTILATION METHODS.

mechanically destroyed. When this is comprehended, it seems as foolish not to take advantage of ozone freshening as it would be to do without the advantages of heating. The artificial supply of ozone in such low concentrations as to reproduce Nature's out-of-door air in uninhabited spaces seems a legitimate effort of the ventilating engineer. And the cost of this effort seems to offer promise of far greater returns than any present ventilating practice offers.

AIR DIFFUSION THROUGH DISCHARGE AGAINST CEILING.

The introduction of air into spaces to be ventilated at slow speed in a horizontal direction, to avoid drafts, does not accomplish the diffusion that high-speed vertical discharge against the ceiling insures. The discharge, cataract effect, against the ceiling in unit ventilator application, seems to get diffusion results that are possible in no other way.

The use of a standard orifice for air flow to various divisions of a system, with total area proportioned to total area of fan discharge, and with conduits for air treated more as reservoirs than as conduits, with such multiples of the standard orifice as will give each division its proportion of the fan delivery, is superior to attempts to govern air flow from friction in the ducts, aided by volume and splitter dampers. The orifices must, of course, be so placed that air flow will be reduced in the passages beyond, so that high velocities will not make objectionable sounds.

Much of the concern about proper humidity will be found unwarranted if recirculation is practiced, and temperatures limited, so that no great volume of out-door air is used in cold weather. It is the constant passage through spaces to be ventilated of great volumes of out-of-door air, raised to high temperatures, so that heat losses will be compensated by drop to the desired room temperature, and not below it, that makes excessive dryness. In crowded spaces, such as class rooms, too much, rather than too little humidity is found in recirculation.

APPLICATION OF PRINCIPLES.

It is usually easier to define principles than to apply them to practical service. Every application is a compromise between the designer's ideal and the limits prescribed by the user's needs and purse.

In attempting to apply the principles outlined, a certain store has been selected, and drawings made to show arrangement. No store management will sacrifice the floor space required by the single shaft rising from basement to roof, in the center of the floor area. So in actual application, the first compromise will occur at this point. There will be others as well.

Let it be borne in mind that the drawings are an attempt to show the application of the principle. And that modifications are recognized as essential for actual use. For the sake of making the principles clear, the modifications are disregarded.

The application contemplates air introduced from the roof through a central shaft, with arrangements for recirculating in winter, and for doubled air flow in summer for cooling, with all air flow at room temperatures from shaft to points of greatest heat losses, with all air cleaned, freshened with ozone, and warmed at each floor, so that different temperatures may be carried within limits, with no air handled through ducts

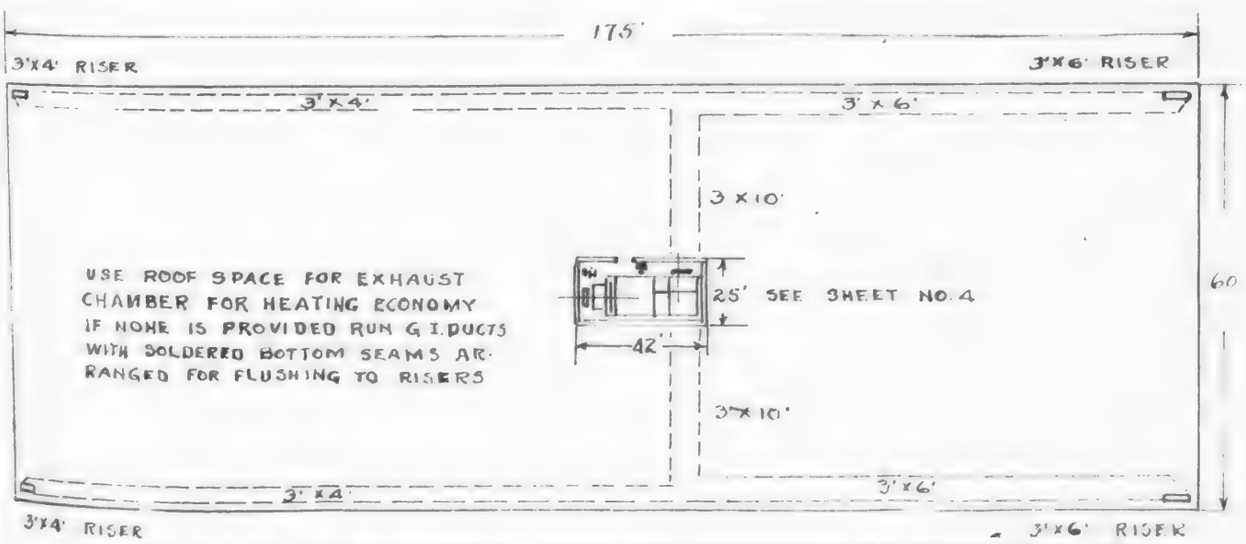


FIG. 2. ROOF PLAN OF DEPARTMENT STORE, WITH ARRANGEMENT FOR RECIRCULATING AIR.

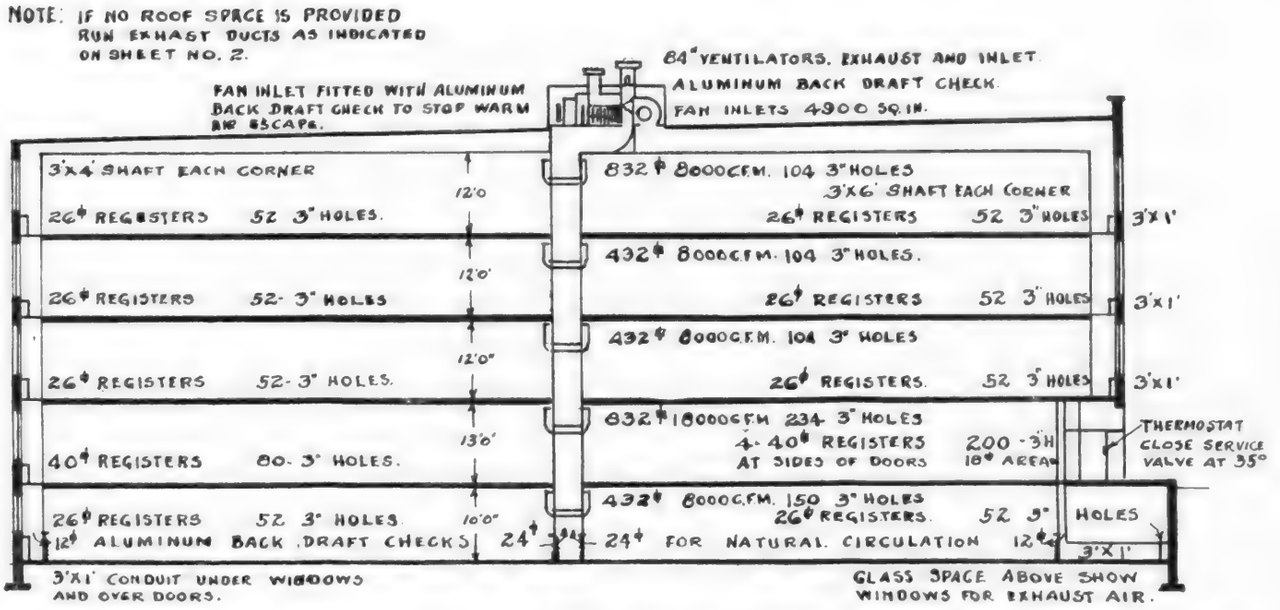

NOTE: IF NO ROOF SPACE IS PROVIDED RUN EXHAUST DUCTS AS INDICATED ON SHEET NO. 2.
84" VENTILATORS. EXHAUST AND INLET.
ALUMINUM BACK DRAFT CHECK.
FAN INLETS 4900 SQ. IN.
FAN INLET FITTED WITH ALUMINUM BACK DRAFT CHECK TO STOP WARM AIR ESCAPE.
3'X4' SHAFT EACH CORNER
832 @ 8000 C.F.M. 104 3" HOLES
3'X6' SHAFT EACH CORNER
26" REGISTERS 52 3" HOLES.
12'0"
26" REGISTERS 52 3" HOLES
432 @ 8000 C.F.M. 104 3" HOLES.
26" REGISTERS 52 3" HOLES
3'X1'
26" REGISTERS 52- 3" HOLES.
832 @ 8000 C.F.M. 234 3" HOLES
4-40" REGISTERS AT SIDES OF DOORS
200 - 3" HOLES 18" AREA
THERMOSTAT CLOSE SERVICE VALVE AT 35°
40" REGISTERS 80- 3" HOLES.
13'0"
26" REGISTERS 52 3" HOLES.
10'0"
432 @ 8000 C.F.M. 150 3" HOLES
26" REGISTERS. 52 3" HOLES
12" ALUMINUM BACK DRAFT CHECKS
24" - 24" FOR NATURAL CIRCULATION
12"
3'X1' CONDUIT UNDER WINDOWS AND OVER DOORS.
GLASS SPACE ABOVE SHOW WINDOWS FOR EXHAUST AIR.

FIG. 3.—VERTICAL SECTION OF DEPARTMENT STORE SHOWING OPERATION OF NOVEL VENTILATING SYSTEM.

after cleaning and freshening, with automatic temperature regulation, and finally, with provision for maintaining spaces above freezing, without operation of fans, for protection of sprinkler system and plumbing, during periods outside of service hours. The building studied receives steam from a district main in the street.

The five drawings make the application clear enough, so that little explanation is needed. The intent is to maintain such a volume of flow towards doors and windows that all temperature drops below that of the room, due to heat losses, will occur in the return air ducts. Thus all inleakage of cold air, with its dirt, and all dust from traffic, will affect only conditions within the ducts.

Accessibility for cleaning the ducts and register boxes below windows, is contemplated. It is proposed that the ducts be made water tight for flushing with a garden hose.

Fig. 1 shows the first-floor plan. This floor is given the greatest amount of air for removal mainly at entrance doors, to eliminate the cold draft troubles of such occasions as holiday traffic. It is proposed to use the space above show windows to provide air flow from entrance doors to shafts in corners.

Fig. 2 shows the roof plan, with proposed ducts to return air

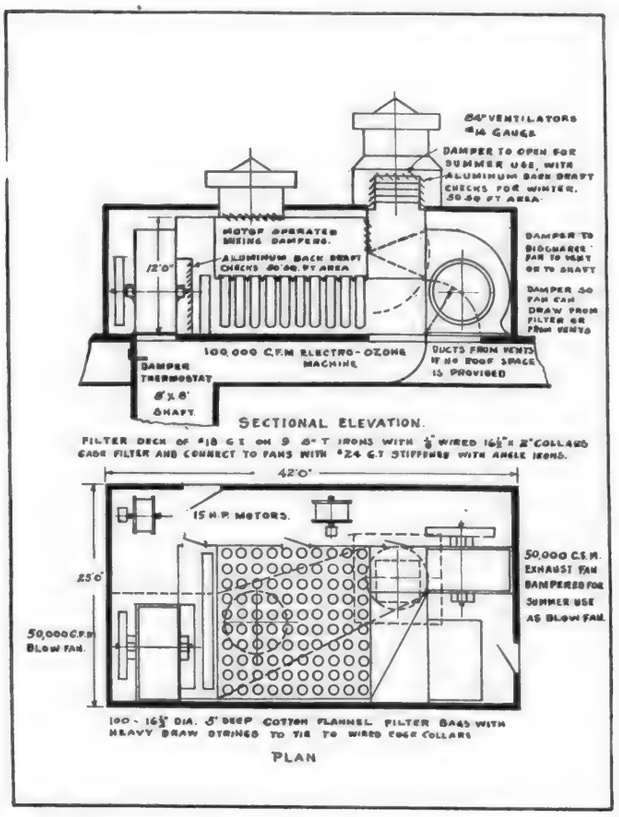

84" VENTILATORS #14 GAUGE
DAMPER TO OPEN FOR SUMMER USE, WITH ALUMINUM BACK DRAFT CHECKS FOR WINTER. 50.50 FT. AREA.
MOTOR OPERATED MIXING DAMPERS.
ALUMINUM BACK DRAFT CHECKS 50'00 FT. AREA
12'0"
DAMPER TO DISCHARGE FAN TO HEAT OR TO SHAFT
DAMPER TO FAN CAN DRAW FROM FILTER OR FROM VENTS
100,000 C.F.M. ELECTRO-OZONE MACHINE
DUCTS FROM VENTS IF NO ROOF SPACE IS PROVIDED
DAMPER THERMOSTAT
6'X6' SHAFT
SECTIONAL ELEVATION.
FILTER DECK OF #18 G.I. ON 9 6" T IRONS WITH ⅜" WIRED 16½" X 2" COLLARS CASE FILTER AND CONNECT TO FANS WITH #24 G.I. STIFFENED WITH ANGLE IRONS.
42'0"
15 H.P. MOTORS.
25'0"
50,000 C.F.M. EXHAUST FAN DAMPERED FOR SUMMER USE AS BLOW FAN.
50,000 C.F.M. BLOW FAN.
100 - 16½" DIA. 5' DEEP COTTON FLANNEL FILTER BAGS WITH HEAVY DRAW STRINGS TO TIE TO WIRED CASE COLLARS
PLAN

FIG. 4.—ARRANGEMENT OF FANS, BAG FILTERS, ROOF OUTLETS AND ELECTROZONE MACHINE.

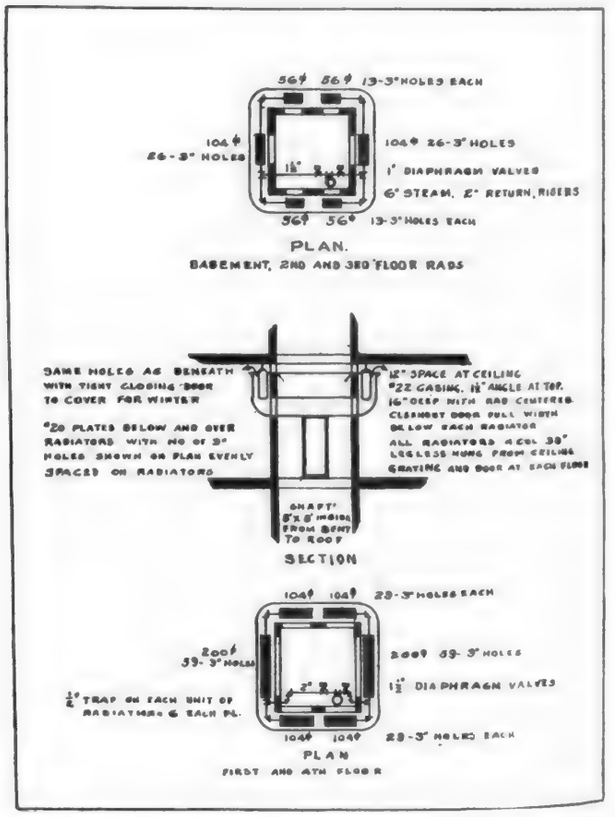

56@ 86@ 13-3" HOLES EACH
104@ 26-3" HOLES
104@ 26-3" HOLES
1" DIAPHRAGM VALVES
6" STEAM, 2" RETURN, RISERS
56@ 56@ 13-3" HOLES EACH
PLAN.
BASEMENT, 2ND AND 3RD FLOOR RADS
SAME HOLES AS BENEATH WITH TIGHT CLOSING DOOR TO COVER FOR WINTER
#20 PLATES BELOW AND OVER RADIATORS WITH NO OF 3" HOLES SHOWN ON PLAN EVENLY SPACED ON RADIATORS
12" SPACE AT CEILING
#22 CASING, 1½" ANGLE AT TOP, 16" DEEP WITH RAD CENTERED.
CLEANOUT DOOR PULL WIDTH OF LOW EACH RADIATOR
ALL RADIATORS 4 COL 38" LEGLESS HUNG FROM CEILING
GRATING AND DOOR AT EACH FLOOR
SHAFT 6'X6' INSIDE FROM BSMT TO ROOF
SECTION
104@ 104@ 28-3" HOLES EACH
200@ 39-3" HOLES
200@ 39-3" HOLES
1½" DIAPHRAGM VALVES
½" TRAP ON EACH UNIT OF RADIATORS 6 EACH PL.
104@ 104@ 28-3" HOLES EACH
PLAN
FIRST AND 4TH FLOOR

FIG. 5.—DETAILS OF HEATING UNITS AND AIR INLETS AROUND AIR SHAFT.

from shafts in corners to fans, if there is no roof space to serve. The fans, filter bags and electrozone machine would be housed in sheet-iron construction on the roof.

Fig. 3 is a vertical section indicating the arrangement of the equipment. Aluminum back-draft checks are indicated to automatically provide for recirculation, when fans are idle.

It will be noted that the arrangement of the heating surface tends to make each floor a separate unit, and that it will to a very large degree prevent overheating of upper floors. Overheating would be certain with a tall shaft and surface for heating all at its base. It is also intended that the register boxes be built in units, so that they may be lifted out, with register faces, for cleaning. It is the intention that the 3-in. holes be evenly spaced back of register faces, to uniformly divide air flow.

Fig. 4 indicates the arrangement of fans, bag filters, roof inlets and outlets, dampers for control of amount of air recirculated, back draft checks, and electrozone machine.

It is the intention to use both fans for out-door air supply in summer weather. In winter weather, it is the intention to close the dampers beneath the 84-in. vent outlet, so that the operation of the mixing dampers from the thermostat at the fresh-air fan discharge will govern amount of air recirculated. That is at 50° for example, all air would be recirculated, while at 60° all fresh out-door air would be delivered.

For winter operation, the dampers at the exhaust fan would be fixed for this fan to draw from ducts. For summer operation, so that this fan would draw through filter bags, from roof ventilators, and discharge to shaft in center of store.

The bag filters are cloth bags held in holes in a sheet-iron deck, so that all air flow is through the bags, at a velocity not to exceed 50 ft. per minute, with all dust, etc., left in the bags.

Removing the bags would be a regular service similar to the former roller towel service maintained in cities. The bags would be laundered and replaced as frequently as required. It might in some localities be a daily performance.

Instead of the draw strings indicated, a better method of holding bags would be a wired edge tapered hoop, shaped like a plug. The hoop would be inserted in the mouth of the bag, the bag dropped through the hole, and the hoop pressed into place.

Instead of the diameter shown, it would perhaps be better to make the diameter equal to two 36-in. widths of cloth, or such other width as is easiest procured, with number of bags reduced to maintain same total area. The sheet-iron deck, of course must be built to carry a man's weight, so as to make changing easy.

The electro zone machine will require A. C. current for a maximum of two kilowatts per hour. Rheostat control would of course be required to vary the ozone output for summer and winter operation. And let it be understood that practice demonstrates that ozone freshening is just as valuable with the large flow of air indicated with both fans drawing out-of-door air, as with recirculation.

Fig. 5 shows the details of the heater application, with provision for the increased air flow intended for summer work.

It is the intention that the 3-in. holes at the ceiling, above the radiators, be closed by doors dropping into shaft, for winter operation, and opened for summer work. The 3-in. holes serve the purpose of uniformly proportioning the delivery of the fans, by converting all the fan energy into static pressure. This has been tried often enough in other applications to prove its working merits.

It is the intention to have a light-weight grating at each floor level. And that all casings, etc., shall be accessible for cleaning. If required, it is intended that a garden hose may be used to flush radiator and casing surfaces into shaft. Shaft is to be construed also to permit flushing.

Let it be understood that this study does not represent an actual application. It shows a combination of features that have been sufficiently tried out in actual service, to warrant the conviction that the combination will work with all the benefits anticipated.

AN ENGLISH METHOD OF FIGURING HEAT LOSSES

A METHOD of figuring heat losses from buildings, which varies somewhat from that in common use, is described by W. W. Nobbs, a past president of the (British) Institution of Heating and Ventilating Engineers, in a paper presented by him before the National Association of Supervising Engineers.

According to the method followed by Mr. Nobbs, the total interchange is separated into "diffusion" and "leakage" losses. The heat loss due to the former, which consists of the air which percolates through the pores of the material, is covered by the coefficients of transmission and therefore need not be considered further. The "leakage" losses include the air passing up ventilating or chimney shafts, the infiltration through window and door crevices and the like.

"The fundamental source of air movement," Mr. Nobbs points out, "is the difference of pressure within and without the building. The constant cause which produces this effect is the difference in temperature maintained between the inside and outside of the building, while wind and such weather effects are inconstant causes. For the purpose of the schedule, given hereinafter, the conventional temperature difference of 30° is assumed to be maintained between the interior and exterior of the building; this conforms to what may be considered standard conditions in this country (England). The wind pressure is assumed to be constant, and at a velocity of 20 ft. per second as being the average for the winter, and thus more nearly approaching actual conditions than it would be to assume still air outside; the latter would require a supplement for every practical condition and "supplements" are apt to be disregarded.

FEATURES COMMON TO ALL BUILDINGS.

The principal features common to all buildings which should be considered in relation to their effect on the natural air interchange are:

(a) The height of the room and its elevation in relation to the rest of the building.

(b) The window leakage, number of external walls, ratio of cubic contents to exposed wall surface.

(c) Whether provided with either, or both, open fireplace and ventilating duct.

(d) General conditions as to exposure and tightness of construction.

It is necessary to consider the height and relative elevation of a room by reason of the aspirating effect of the warm building. Thus this effect is greater on a ground floor room than on the top floor; the "pull" is likewise stronger than it is on the same floor of a three-story house. The upper floors, on the other hand, are not so protected from winds as those near the street level.

SELECTION OF "DATUM" ROOM.

In selecting a "datum" room, two courses appeared to be open. The first and most obvious was to follow the lines that would be adopted if the interchange were to be experimentally

determined, *i. e.*, it would be necessary to select or build the room before starting the test. Consequently, to follow this procedure in theory, the rate of interchange would have to be calculated from a room of given dimensions. That has the advantage that the interchange for the datum room would almost certainly be a fractional quantity. The alternative, which was adopted, was to fit the lock to the key, and select a room in which, under the standard conditions, the interchange would be unity. This has the practical advantage that in comparing the rooms in which the leakage is to be computed with the datum room, the allowances for variance will be expressed as a direct proportion of the cubic contents of the room under consideration. A further advantage is that the datum, as already selected, is as nearly as possible a composite of the various rooms it is intended to measure.

The datum room was arbitrarily selected as having a leakage of one interchange per hour, a theoretically top-floor room, 12 ft. high, 18 ft. deep, one long line exposed, having neither vent nor fireplace, normal tightness of construction, average exposure with wind velocity at the average winter velocity of 20 ft. per second, 30° F. outside and 60° F. inside the room, the said interchange being in addition to the portion taken care of by the transmission coefficient. By a "theoretical" top-floor room is meant one which has no column of warm air above it to influence the air movement through the room, but which, on the other hand, is not subject to heat loss through the ceiling, as would be the case in an actual top-floor room; thus the datum room can be used in comparison with a normal room on any floor.

DETERMINING AIR INTERCHANGES UNDER DIFFERENT CONDITIONS.

The interchange of the datum room under average or standard conditions having been thus decided upon, the next step was to apportion values or fix the problematical interchange of the same room when under the influence of sources of leakage common to most rooms, and which must be considered in any estimate having a rational foundation. The first of these is the relative height or elevation with regard to the aspiring effect of the building.

Other conditions being equal, the interchange would vary as the square root of the height of the column of warmed air, but in practice other conditions are not equal; the upper floors, for instance, short circuit the lower floors through staircase and lift wells; the influence of more free exposure to wind effect on the upper floors also has a counter effect, which tends to equalize the interchange in upper and lower rooms. In view of such consideration, and assuming for general purposes 12 ft. floor to floor as nearest to the average height of all the rooms coming within our survey, the factor for relative height was apportioned as follows:

	Interchange.
Datum room on top floor	1.00
" " one floor below top floor	1.10
" " two floors	1.18
" " three "	1.25
" " four "	1.31
" " five "	1.36
" " six "	1.41
" " seven "	1.45

A similar and equally consistent factor for a building of different height, floor to floor, can be obtained by taking 25% of the increased difference theoretically due to height.

EFFECT OF EXPOSED WALLS AND WINDOW LEAKAGE.

The next source of leakage considered was the effect of exposed walls and window leakage. The amalgamation of these important sources of leakage into one factor cannot be made without sacrifice of accuracy, but it is essential to make some concession to the time available and the information given on the average set of architectural drawings, if the schedule is to be of any practical use. The allowances made in respect of these considerations are:

			Interchange.
1 side exposed	=	datum room	= 1.0
2 sides "		increase 30%	= 1.3
3 sides "		increase 50%	= 1.5

For similar reasons, the ratio of cubic contents to exposed wall area is reduced to noting the *depth* of the room. The depth is the distance from the exposed wall to the back of the room in the case of rooms having one outer wall, while in the case of rooms with two outer walls the depth would be measured back from the longer of the exposed walls. This "short cut" is made on the assumption that the third dimension, *i. e.*, the height, is a fixed one, namely, 12 ft. The depth of the datum or unit room was taken at 18 ft. as most nearly conforming to the average depth of room with which the engineer has to deal. Generalization was carried further in dividing all rooms into three categories of depth, namely, 12, 18 and 24 ft. deep. Thus small living-rooms and offices varying from 8 to 14 ft. deep would come in the 12 ft. class; rooms 15 to 21 ft. deep into the 18 ft. or datum class, and those between 22 and 26 ft. deep into the largest denomination. The allowances made in the schedule in this respect are:

	Interchange.
Rooms 24 ft. deep, decrease normal by 20%	= 0.80
" 18 ft. deep, datum or normal	= 1.00
" 12 ft. deep, increase normal 25%	= 1.25

The influence of a chimney or ventilating extract duct depends on the area of same as well as on the height and temperature which are already allowed for in other conditions, but it would entail too much consideration if in practical computations the area of each air extract duct and fire-place had to be considered. The existence of one or the other or both is recognized by making a general all-round allowance of 15 per cent. increase for each fireplace (fire not lit) or duct.

These allowances for the main sources of air leakage are summarized and tabulated ready for use in the accompanying schedule. Its application is as follows: The usual particulars for arriving at the transmission losses having been tabulated, to get at the interchange the draughtsman notes mentally as follows: 1st, what floor of the building he is dealing with; assume, for example, it is the second floor of a four-story block, then the factor will be in a column headed "1st floor *below* top floor." The next point to look for is the number of external walls; assume the same to be one outer wall, which will restrict the factor to the first nine lines. Next, consider the depth, which will still further confine the factor to three lines, and the actual line is finally found by noting whether neither, either, or both fireplace or duct exist in the room.

It is hoped that with the schedule of air interchanges which summarizes these considerations, members will be in possession of data and methods which conform to modern practice in estimating the amount of heat lost from a room or building under a steady state of heat flow. It is recommended that particulars taken on a visit to the building or read from the plans should be entered on a standardized form and filed for reference, as they will form a valuable guide for the future when comparing with actual results.

EXPOSURE FACTORS.

It is the author's practice to make an addition to the foregoing to cover different exposures, of 5% for rooms or houses having litle exposure, such as town houses or country houses well protected by trees, 10% addition for houses of medium exposure, and 15 % for houses having abnormal exposure. The further customary factors for aspect are 10% addition for rooms facing E. or N. W., and 10% to 15% addition for N. and N. E. aspects. These factors are necessarily empirical and should be applied judiciously.

SCHEDULE OF AIR CHANGES PER HOUR

External Walls.	Depth of Room.	Ventg. duct or fireplace.	Top floor	Rooms below top floor. 1st	2nd	3rd	4th	5th	6th	7th
1	24 ft.	Neither	0.80	0.90	0.95	1.00	1.05	1.10	1.12	1.15
1	"	Either	0.90	1.00	1.10	1.15	1.20	1.22	1.27	1.30
1	"	Both	1.05	1.15	1.25	1.30	1.35	1.40	1.47	1.52
1	18 ft.	Neither	1.00	1.10	1.20	1.25	1.30	1.35	1.40	1.45
1	"	Either	1.15	1.25	1.35	1.45	1.50	1.55	1.60	1.65
1	"	Both	1.30	1.45	1.55	1.65	1.70	1.77	1.82	1.90
1	12 ft.	Neither	1.25	1.40	1.50	1.60	1.65	1.70	1.75	1.80
1	"	Either	1.45	1.60	1.70	1.80	1.90	1.97	2.05	2.10
1	"	Both	1.65	1.80	1.95	2.00	2.10	2.22	2.30	2.40
2	24 ft.	Neither	1.05	1.15	1.25	1.30	1.35	1.40	1.47	1.52
2	"	Either	1.20	1.30	1.45	1.50	1.55	1.62	1.70	1.75
2	"	Both	1.35	1.50	1.60	1.70	1.75	1.85	1.90	1.95
2	18 ft.	Neither	1.30	1.45	1.55	1.65	1.70	1.77	1.82	1.90
2	"	Either	1.50	1.65	1.80	1.90	1.95	2.05	2.10	2.17
2	"	Both	1.70	1.85	2.00	2.10	2.20	2.30	2.40	2.50
2	12 ft.	Neither	1.65	1.80	1.85	2.00	2.10	2.22	2.30	2.40
2	"	Either	1.85	2.05	2.25	2.35	2.45	2.50	2.60	2.70
2	"	Both	2.10	2.30	2.55	2.65	2.75	2.85	2.95	3.05
3	24 ft.	Neither	1.20	1.30	1.45	1.50	1.55	1.62	1.70	1.75
3	"	Either	1.35	1.50	1.60	1.70	1.75	1.85	1.90	1.95
3	"	Both	1.57	1.75	1.90	1.97	2.05	2.15	2.20	2.30
3	18 ft.	Neither	1.50	1.65	1.80	1.90	1.95	2.05	2.10	2.17
3	"	Either	1.65	1.80	1.95	2.00	2.10	2.22	2.30	2.40
3	"	Both	1.95	2.15	2.30	2.45	2.55	2.65	2.75	2.85
3	12 ft.	Neither	1.87	2.05	2.20	2.35	2.45	2.55	2.62	2.72
3	"	Either	2.17	2.40	2.55	2.70	2.85	2.95	3.05	3.15
3	"	Both	2.47	2.70	2.90	3.10	3.25	3.35	3.50	3.60

The Fallacy of Superheating Exhaust Steam.

The superheating of exhaust steam has frequently been advocated. On the surface this appears to be an economical method, but there is, however, a "nigger in the wood-pile."

Let us consider a steam coil located in a room, which is to be heated to a temperature of 250° F. Now the temperature of exhaust steam is 212° F., and sometimes an engineer will approach an owner and say, "Why not heat your exhaust steam from 212° to 260°—a difference of 48°—and you can easily obtain the 250° temperature desired in the chamber?"

This looks alluring to the owner who usually does not know anything about the physical properties of steam and he may say to the engineer, without further thought, "Go ahead and have the superheater put in. That sounds like a very good, logical, cheap way to get the heat we need."

The superheater is installed, the exhaust steam is passed through the superheater and is superheated to the temperature of 260°. The arrangement works very nicely for a while or until a certain temperature is reached in the coil. Then the superheater stops operating.

What is the matter? The explanation is this: Exhaust steam at atmospheric pressure will not condense unless the temperature surrounding it is less than 212° F. just as soon as the temperature in the coil is higher than 212° F., it becomes impossible for the steam to condense. Hence the steam coil simply fills up with steam, and the steam remains there as long as the temperature is higher than the temperature corresponding to atmospheric pressure, which is 212° F.

Ordinarily, without superheating, to attain a temperature of 260° in the steam coil a gauge pressure of 21 lbs. per square inch is necessary. Then, as long as the temperature in the surrounding chamber is less than 260°, the steam within the coils will condense, and it can be trapped out easily. Hence with live steam no difficulty is experienced in maintaining a temperature of 260° F. in the coil as long as the heating surface is efficient.

Where the superheated steam can be kept in motion and passed through the steam coils and the exhaust from the coils or from the chamber used for heating or other purposes, it might be profitable to attach superheaters, but this is a point that should be looked into carefully before any steps are taken, since it can be proved that in many instances the use of a superheater is simply superfluous equipment.

Rather than superheat the exhaust steam where it is primarily a problem of attaining a certain high temperature, it is frequently more economical to simply apply a naked flame or to apply high-pressure steam directly to the heating surface of the chamber.—W. F. SCHAPHORST.

Investigating Effects of High Temperatures and Humidities.

The Bureau of Mines, in co-operation with the United States Public Health Service and the American Society of Heating and Ventilating Engineers, is engaged in a study of the relative importance and correct correlation of the many individual factors concerned in the problem of the physiological effects of different conditions of temperature, humidity, and air motion. A special room has been constructed for this purpose at the Pittsburgh station in which the air conditions are controlled by apparatus outside the chamber and entirely separate from it.

A comprehensive program, which includes a quantitative study of a considerable number of bodily functions, is being carried out. The work has not yet been completed, but enough has been done to demonstrate the importance of determining the physiological reactions to environment as a measurement of the harmful effects of heat and humidity, and to show that feelings of discomfort as a standard of measurement cannot be depended upon because there is a certain adaptation of the sense organs to an unchanging environment, and individuals differ in their sense reactions.

The Heating and Ventilating Magazine

A MONTHLY JOURNAL OF ENGINEERING PROGRESS

Member of the Associated Business Papers Inc.
Member Audit Bureau of Circulations.

Vol. 19 October, 1922 No. 10

Published Monthly at Cooperstown, New York, by the
HEATING AND VENTILATING MAGAZINE COMPANY
Executive and Editorial Offices
1123 BROADWAY, NEW YORK
A. S. ARMAGNAC . . . . . President and Editor
GUSTAVE PETERSEN, Secretary-Treasurer and Business Manager

European Representative
W. G. HOLLINGWORTH, 38 Victoria St., London, S. W.

Subscription	$2.00 per year
Canada	2.25 per year
Foreign Countries	2.50 per year
Back numbers	25 cents each

IT HAS puzzled many to know why the present building boom can continue so long at such high prices for materials and labor. In fact it is being openly predicted that "a few months hence" will see a marked drop in construction activity. This, however, is a pretty safe prediction to make in view of the fact that building permits in twenty leading cities will reach for the year approximately $1,300,000,000, the highest record ever known, being more than half a billion in excess of last year's figures.

The argument of those who look for a falling off in building activity runs about as follows: The enormous bulk of construction, with few exceptions, is going on under a still inflated currency and with building materials and labor schedules at practically 100% above prewar levels. While this enormous operation may appear to be impelled by the law of supply and demand, as a matter of fact, it is not. In reality it is a race between builders for the artificial market created under abnormal post-war conditions. The race is also very close and most of the builders will arrive upon the market with their output at about the same time. The result, it is figured, will be a glut, with inevitable loss to owners.

In the meanwhile, it is maintained, this abnormal demand itself is the very thing that is keeping building costs at the zenith and these costs will continue at the zenith until losses are realized and the market begins to crumble. The imminence of the expected slump is attributed to an over-supply of the new "high rent" type of construction. It is impossible to build now unless a top notch rent is the yield and most builders, particularly of apartment houses, therefore, are building to sell.

GOOD HEALTH WEEK, which is scheduled for the week of October 23–30, offers an opportunity which does not often come to the ventilating industry to reach the ear of the great American public. Among the points of attack which will be especially emphasized in this campaign is the part ventilation plays in increasing the health and efficiency of workers and the cost to industry of dust hazards and the diseases in which they are a factor. Those in charge of the movement have shown some of the effective ways in which the campaign may be conducted. It remains for the industry as a body to get behind the campaign and see to it that in each locality Good Health Week is given prominence in the local press and in the offices and plants of those who have ventilating apparatus to sell, design or install.

WHAT the large heating and ventilating contractors in the East are actually proposing in the way of heating installations to meet the present fuel situation is illustrated in the practice of one prominent engineer who states:

"At the present moment on new installations of sufficient size we are inclined to recommend the use of oil, but under no circumstances do we suggest the elimination of provisions for burning coal. When the coal situation is relieved, and it appears now that it will be, the people who have real interest in the subject of oil burning and who are devoting their talents and energies along safe and sane and satisfactory lines will continue their efforts with the result that the art of oil-burning will progress considerably beyond its present stage."

In ordinary house-heating work, where but few changes are needed, the number of oil-burning installations is increasing at an impressive rate.

SERVICE DEPARTMENT

Steam Consumption of Kitchen Equipment.

Because of the many inquiries received for data giving the amount of steam required by kitchen, laundry, and other apparatus, the information given herein is presented as covering the average requirements likely to be encountered, and may be used in the absence of definite information from the manufacturer of the equipment to be installed.

Conditions vary so greatly that it is impossible to figure accurately the consumption of steam used by the various items of equipment. The consumption can only be arrived at by actual experiment, taking into account the exact size or capacity of the equipment in question, metal used in construction, amount of use and abuse, contents to be heated, room temperature, steam pressure, and whether saturated or superheated steam is used.

STEAM CONSUMPTION OF KITCHEN APPARATUS

Kind of Service and Location	Urns	Kettles, Pots, Boilers	Steamers and Cookers	Warmers	Washers	Steam Tables	Bain Marie	Hot Water Heaters	Remarks and Miscellaneous Equipment	Lbs. Steam per Day	Ave. No. of Persons Fed Daily	Approx. Lbs. Stm. per Person Daily
Counter Lunch Rm. Chicago	2-4 Gall. 6-15"	* 1-5 G.J.K.		1-12"x12"x 16"-Bean			1-24"x60"	1-24"x72"	*G for Gallon, J for Jacketed, and K for Kettle	3,300	2,000	1.65
Rest. in Apt. Hotel N.Y. City				1-60"x36"x 24" Plate						1,000	330	3.00
Cafeteria or Lunch Club-Chicago	3-10 Gall.		1-16"x24"x 12" Veg. Stm	1-Plate			1-24"x24"	1-24"x60"		3,300	800 to 1,000	3.66
Dairy Lunch Chicago	3-10 Gall.				1-Dish (Open Jets)		2-18"x84"	1-		3,660	1,000	3.66
Cafeteria or Lunch Club-Chicago	4-10 Gall			2-24"x36"x 36" Plate 1-36"x48"x 72"-Roll 2-Bread	2-Dish (Open Jets)		2-24"x20"	1-24"x48"		5,550	1,200 to 1,400	5.27
High Class Rest. in Office Bldg.-Boston	12-Coffee & Hot Water	4-J.K	1-Veg. Cooker	2-Bread 3-Dish	1-Dish 1-Silver		4-	2-		6,164	1,146	5.38
Buffet Lunch in Office Bldg. N.Y. City		2-K. 12" dia x 6' deep							Located Down-Town	3,978	600	6.60
Hig Class Chinese Amer. Rest-Chicago	2-10 Gall.			2-12"x48" 8 Plate			1-24"x7' 1-24"x9'	1-		3,500	500	7.00
Rest in Large Club House - N.Y. City	3-12 Gall. Coffee	1-15 G.K. 1-40" " 2-50" "	4-6"x24"x 12" Veg. Stm	12-Plate	2-4 Basins - Dish	1-20"x3'			1-3 Compt Egg. Boiler	5,880	500 to 600	10.00
Club Rest in Down Town Office Bldg. N.Y. City	2-1G-Tea 4-5G-Coffee 1-7G "	1-60 G.K. Soup 1-K-18" dia		1-24"x60"x 72" Plate	2-18" dia Dish	2-36"x36" x8" 1-24"x96" x5"	2-30"x24" x12"			8,124	800	10.00
Kitchen in High Class Apt. Hotel - Boston	1-20 Gall - Hot Water 1-15 Gall - Coffee	1-J K-16" dia 1-Stock K	2-20"x26" x16" Veg. Steamers 1-Pudding Steamer	1-3'x1'x3' - Silver 1-4'x2'x3' - Dish 2-6'x2'x3' Dish 1-6'x3'x3'		1-2'x10'	1-36"x42"		1-Oven-½" Connection * Hot Water not included	* 5,960	500	11.90
Club Rest. in Down-Town Office Bldg. - N.Y. City	2-22" dia x30" deep 1-20" dia x38" deep	3-20"x28" x14" K. 2-22"x22" Stock Pots		4-57"x22" x22" Plate	1-2 Basins - Dish		1-22"x57" 1-30"x50"			7,633	500 to 600	14.00
High Class Rest. in Down-Town Office Bldg. - N.Y. City	2-17G. Hot-Water 3-8G. - Coffee	1-K. 42" x 24" deep 2-24"x20" Boilers 1-24"x24" Stock Pot	1-18"x24" x18" Stm	1-24"x48"x 36" Plate		1-180"x48"				11,900	800 to 900	14.00
* Kitchen in First Class Hotel	6-Coffee 4-Water	3-J.K.-3' dia		2-2'x4'x8" 1-6'x5 3/4"x24" 2-2'x5'x6' 1-2'x5'x5'		1-2'x5½' 1-2'x9' 1-2'x12' 1-13½"x3½" Carving	3-2½'x3'		* From Heating & Ventilating Magazine - Jan 1922 1-12 Compt Egg Boiler 1-2'x2'x2' Roll Heater 1-2'x2'x3' " "	6,310	350	18.00
Highest Class Restaurant Chicago	3-12 Gall	1-36" dia. J.K. 2-36" dia Grease K	3-24"x36"x 12" Veg. Stm 1-24", 36"x 48" Veg. Cooker 1-12" dia Lobster Stm	1-12"x36"x 21" Plate 3-72"x36"x 18" Plate 1-16"x18"x 48" Cup	1-Dish Open Jets in Sink-4	2-36"x48"	1-24"x48" x72"	1-36"x72"	1-Milk Tester 1-Egg Boiler 6-Oyster Pots-5" dia	20,000	1,000	20.00
* Rest. Kitchen in Gimbel Bros. Dept Store - N.Y. City	5-Coffee	1-Grease Boiler 5-Caldron Boilers		1-Cap 1000 Cups 1-Cap 1000 - 1400 Plates					* From Heating & Ventilating Magazine - Jan. 1922 Service a la carte 770, table d'hote 159 2-Oyster Blows 18,619	Food supplied to counters elsewhere in store not included, 923 *		20.00
* High Class Rest In Office Bldg - N.Y. City	1-24"x18"x 24" Boiler 1-K 10" dia				1-Dish	1-72"x30"		1-60"x60"	* Located Down-Town 1-5 T Refrigerating Machine	Yearly 2,600,000	—	—
Drug Store Lunch Counter - Detroit						1-10'x3' "4"			Serves noon lunch. Counter seats 26 - Used 4 hrs. per day	126	—	—
Newspaper Printing Shop - Detroit						2-3'x3' x4"			Used for drying paper impressions - 4 editions daily.	1,907	—	—
Cafe & Rest. in 2nd. Class Hotel - Detroit				1-4 Shelves Plate-18#		1-0½"x2½"x6" 2-36"x27"x8"			Used 11 hrs. per day Seating Capacity - 178	2,330	—	—
Low Price Rest Detroit						1-10"x2'-8"			Used 24 hours per day Seating Capacity - 144	3,015	—	—
Data from a Manufacturer of Kitchen Equipment	1-3 Urn Battery Coffee, Tea Urn 8 Gall, uses 60# per hr	1-60 to 70 G.J.K, uses 103½ # per hr		1-8' long x 2½' wide, with 2 rows of coils uses 34½# per hr		1-10'lg x 2' wide, water pan coiled, uses 51# per hr	1-(Hot) 6' lg x 2' wide x 10" deep, uses 26# per hr		1-3 Bucket Egg Timer uses 17# per hr Use figures for estimating only, as actual steam consumption depends on the steam pressure used, etc	—	—	—
* Data from Electrical Salesmans Handbook - N E L Assn	1-5 Gall Coffee-15# 1-10 Gall Coffee-30# 1-Chocolate 15#	1-5 G.J.K-15# 1-Stock K 30# 1-Soup K 30#	1-Veg. Stm 60#	1-Plate-30# 1-Small Bean-15#	1-Dish-(Single) 30# Dish Wash Sinks-30# Silver Wash Jets-30#	1½# per Sq Ft	3# per Sq Ft	1-Hot Water Tank 30#	1-Boiler (Egg, 15#) (Potato, 60#) 1-Oyster Pot 15# Add 20% to figures if exhaust steam is used - Figures given are lbs. per hr. * Likewise published in "District Heating" by Bushnell & Orr, also N.D.H. Assn. Handbook.			

Except where noted otherwise, the above data rearranged from N.E.L.A. Proceedings Comm. 1913, P 483-6 (as published in N.D.H.A. handbook)

The steam consumption does not depend so much on the efficiency of a particular piece of apparatus as it does on the morale of the kitchen force. Quite often, warmers will be found with doors wide open, kettles with covers left off, and all equipment left with steam turned on during the night, or at other times when heating is not necessary.

Neither is it necessary to admit steam to the equipment well ahead of time, nor to keep it on until cooking is done. Considerable saving can be made by turning off the steam, say, 20 minutes before cooking is complete, and by insulating the kettles, as is customary with electric-heated equipment, also by using steam at low pressures instead of high-pressures.

The Canadian Government made a careful investigation of this question, and by extensive experimental work in its various institutions established the fact that low-pressure steam of not more than 5 lbs. pressure is both efficient and desirable for the cooking of food, being sufficiently high in temperature to accomplish the desired results quickly and satisfactorily.

Data[1] bearing on this question will also be found in the Handbook of the National District Heating Association, as well as in this association's Proceedings 1914—p. 362, 1915—p. 216, and 1916—p. 64. These data were taken from tests as made on kettles, cookers, warmers, steamers, and hot water urns, the tests being made in order to determine the feasibility of the operation of such equipment at pressures which might be expected in a low-pressure steam system.

As for laundry equipment, considerable information may be obtained from Data Sheet No. 172-D, as published by THE HEATING AND VENTILATING MAGAZINE, also from the N. D. H. A. Handbook as reprinted from the N. E. L. A. Electrical Salesman's Handbook. The former book also gives the steam consumption in tanneries, a matter which was previously reported in the N. E. L. A. Proc. Comm. 1913—p. 482.

In connection with sterilizers in hospitals, it may be said that it takes five minutes for them to reach the required temperature of 256°, the pressure carried being usually 15 lbs.,[2] as the safety valve is set at 18 lbs. A ½-in. line and clear return is also required.

1. See also A. S. H. V. E. Transactions—1914, V. 20, p 421-424, as well as V 22 of 1916, p 107-119.
2. As reduced from the hospital main steam supply of about 45 lbs. pressure.

Rate of Heat Transmission Through Tubes of Water Service Heaters.

QUESTION: Have you any data on the rate of heat transmission through tubes of water service heaters; for example, how many square feet of coil heating surface are required in a heater to raise 100 gal. of water per minute from 40° to 150° F., using steam at 50 lbs. gauge pressure (temperature 297.7°), also tubes of 1 in. diameter?

ANSWER: Formulae 1 and 2, as given below, may be used to estimate the quantity of heat required in water service heaters, No. 1 for the steam-tube type, and No. 2 for the water-tube type.

For Formula No. 1, $A = \frac{H}{K D}$, for Formula No. 2, $A = \frac{H}{K \times \sqrt{V} \times D}$, where H = total amount of heat in B. T. U. to be transmitted, or the pounds of water per hour multiplied by the temperature rise in degrees, D = mean temperature difference between the water and heat medium, V = velocity of the water in feet per second, and K = coefficient of heat transmission.

EFFECT OF VELOCITY UPON THE RATE OF HEAT TRANSMISSION.

Formula 1 is used for the steam-tube type of heater because in this type the water (being dependent for its circulation on gravity only) passes at a low [1]velocity around the tubes through which the steam is flowing; therefore, the effect of its velocity on K does not enter into the calculation of the problem. In the water-tube type of heater, the rate of heat transmission is increased because the water is passed through the tubes, thereby increasing its velocity over tube heating surfaces. Because of this, Formula 1 is modified for water-tube heaters, so as to include the square root of V (as given in Formula 2), most investigators considering that the rate of heat transmission varies as the square root of the velocity.

The velocity (V) varies for any given service in the various designs of heaters,—in a steam-tube type the velocity, and therefore the efficiency, will be very low as compared with one of the water-tube type; also in a water-tube heater with small tubes, the velocity will be much higher then in the same type of heater having a like number of tubes of larger size. There is, of course, a minimum smaller than which it is not desirable to make the tubes, because as the size of the tubes is decreased, the frictional resistance is increased, with consequent loss of head.

A higher velocity of the water can be obtained in a plain copper tube than in a corrugated tube, because the frictional resistance and pressure drop is not as great with a high velocity in plain tube, as it is with the same velocity in a corrugated tube. Thus, one manufacturer of heaters uses, for corrugated and plain tubes, velocities of 3 and 5 ft. per second, respectively.

The rate of heat transmission which is the product of $K \times \sqrt{V}$, has been determined by experiment to be as high as 1600 for small clean tubes with the water flowing through the tubes at an average velocity of 8 ft. per second, but in the steam-tube type, this value would not exceed 250, in fact, one large manufacturer of such heaters bases his design of heater on a value of 110 for K.

[2]Coefficients of heat transmission (values of K) through copper tubes, as used by one manufacturer, are given in the following table for velocities of one foot per second.

Tubes O. D.-In.	K	Proper Gauge S. W. G.	Thickness Inches
¾ corrugated	500	20	0.035
¾ plain	300	20	0.035
1 plain	200	18	0.049
1¼ plain	100 to 150	16 or 18	0.065 or 0.049
1½ plain	100 to 150	16 or 18	0.065 or 0.049

Kent also gives the B. T. U. transmitted per square foot of heating surface per hour per degree of temperature difference in the following tables.

Tubes	*Velocity of Water, Feet per Second.*						
Inches	0.5	1	2	3	4	5	6
¾ horizontal brass	...	500	530	560	585	615	650
1¼ horizontal copper	250	365	590				
1¼ horizontal corrugated	360	560					
1½ horizontal corrugated	460						

Tubes	*Velocity of Water, Feet per Minute.*						
Inches	22.5	24	34	43	82	114	137
1¼ smooth	185	...	...	...	...	570	670
1½ corrugated	...	318	444	465	735	...	...

1 Especially in a heater of large storage capacity.
2 Some manufacturers publish in their catalogues the square feet of coil heating surface installed in their heaters for various capacities, so that the rate of heat transmission which they use can be determined by working backward from the given figures.

OTHER FACTORS AFFECTING THE TRANSMISSION OF HEAT.

The rate of heat transmission depends, not only upon each change in velocity, but also varies according to the size, character and condition of the tubes. These three factors determine the value of K for the water-tube type of heater, but for the steam-tube type the greatest variation in the value of K is due to the condition of the tube itself, that is, to the amount of scale or other foreign matter on the inside and outside of the tube, which, in extreme cases, may prevent nearly all transmission of heat.

If in the question, the velocity of the water flowing through the tubes is assumed as 1 ft. per second, and K for a plain 1-in. tube is taken at 200, as given in the tables, then in the problem under consideration, the possible rate of heat transmission, or the B. T. U. that would be transmitted from the steam to the water, would be 200 times the square root of 1, or 200. However, 80% of 200 is a safer figure to use, as in actual practice the ideal conditions of tests are not always realized, so that an overload capacity of 25% is a desirable asset.

DETERMINING THE MEAN TEMPERATURE DIFFERENCE.

In calculations of heat transmission in heaters, quite often the mean difference of temperature is taken as the difference between the temperature of the steam and the arithmetical mean of the initial and final temperatures of the water. Thus, $D = S - \frac{1}{2}(I + F)$, where D = mean difference, S = steam temperature, and I and F = initial and final temperatures, respectively.

According to [3]Billings, this method is not correct, and on the assumption that the rate of transmission through any surface is directly proportional to the difference, he finds the true mean to be [4]$D = \frac{F - I}{\log_e (S - I) \div (S - F)}$

As stated by Kent, the error in using the arithmetic mean for the value of D is not important if F is very much lower than S, but if it is within 10° of S, then the error may be a large one. With S = 212, I = 40, F = 110, the arithmetic mean difference is 137, and the value by the logarithmic formula 131, an error of less than 5 per cent; but if F is 204, the arithmetic mean is 90, and the value by the formula is 53.5.

However, the formula is based on an assumption that is probably greater in error for high temperature differences, i. e., that the transmission of heat is directly proportional to the temperature difference. It may be more nearly proportional to the square root of the difference, as stated by Rankins. This seems to be indicated by the results of heating water by steam coils, as given in the fitters' book of the American Radiator Company from tests made by its Thermal Research Bureau.

With the foregoing information in hand, the problem presented in the question may now be solved, using Billings' logarithmic formula to determine the mean difference in temperature, as follows:

$$D = \frac{150 - 40}{\log_e (297.7 - 40) - (297.7 - 150)} = \frac{110}{\log_e 1.745} = \frac{110}{.5568} =$$

197.4°, then by Formula 2,

$$A = \frac{6000 \text{ G. P. Hr.} \times 8.33 \times (150° - 40°)}{200 \times \sqrt{1} \times 197.4°} = 139$$

Thus, 139 is the required square feet of tube heating surface, taken as the mean surface, that is, an average between the inside and outside diameter of the tube.

In conclusion it may be pointed out that $\log_e$ refers to hyperbolic or natural logarithms, and, as tables of such logarithms are not usually as available as those of common logarithms, it may be said herein for the convenience of the reader, that the common logarithm of any number may be converted into a natural logarithm by multiplying the common logarithm by 2.3026, which is usually abbreviated to 2.3. Thus, the common logarithm of 1.745 is 0.2418, which multiplied by 2.3 = 0.5568.

[3] In the *National Engineer*, June, 1907, as related in Kent.
[4] This formula was derived by Cecil P. Poole in 1899, *Power*, Dec., 1906. A convenient table calculated from this formula may be found in the catalogue of The Alberger Heater Co.

Use of Coke in Homes Urged by Bureau of Mines.

In view of the hard coal shortage, the Bureau of Mines has come out with a formal recommendation that coke be used for heating houses. It is described by the bureau as a clean and convenient fuel. "It eliminates smoke," continues the bureau's statement, "reduces the necessity of cleaning the furnace and flues, requires less attention than coal, and gives a more uniform temperature in the house. By burning coke for domestic heating, more soft coal will be used in by-product plants which save many valuable by-products that are wasted when the coal is used directly in the raw state. The by-products of popular interest obtained in the coking process are gas, light oils, ammonia and tar."

Although coke is a quite satisfactory domestic fuel, the Bureau of Mines suggests that new coke consumers, accustomed to the use of anthracite, must adapt themselves to new methods of firing. A few weeks' experience in the use of coke will readily show how it can best be used. The primary characteristics of coke because of its porous nature, are greater bulk and more ready combustion. The factor of greater bulk cannot be overcome, but most house-heating furnaces have sufficient fire-box capacity to carry fire over night, except during the most severe winter weather. If there is any anthracite on hand, it should be kept for use at night during extreme cold weather periods.

"To offset the factor of more rapid combustion of coke," continues the statement, "the fire should be kept under control by limiting the supply of air through the ash pit. See that the joints between the ash-pit ring and the furnace ring and ash-pit ring and floor are perfectly tight; if not, have the cracks filled with stove cement or other adhesive. The ash-pit door should fit tightly. The register in the ash-pit door can be easily operated to control draft.

"The fire is started by first feeding a thin layer of coke (about 6 in.) on the wood kindlings after they have become well ignited with the draft on. When this layer of coke has been well ignited, fill the fire-box and cut down the draft until the coke will just continue to burn. Do this by closing ash-pit door and cutting down the chimney draft by means of check-draft damper, not by opening the firing door. Keep the fire always under control; do not let it blaze up and then try to cut it down again suddenly.

"By filling the fire-box completely; the draft is kept more constant, preventing sudden blazing up, and the tendency to prevent formation of clinkers, and burning out of grates is avoided.

"In cleaning fires, follow the same practice as with coal, except that in some cases it will be found best to let an inch or two of ashes remain on the grates to cut down the air supply through the grates. Pull clinkers out through the fire door before firing, once a day.

"An important advantage possessed by coke over bituminous coal is the eliminating of smoke and the minimizing of dirt in the furnace room from dust and soot escaping from the furnace. Another advantage is that coke does not require poking down, as no coke arch forms over the fire. The use of coke simplifies draft regulation; sufficient air is obtained through leaks around the ash-pit door and therefore no regulation of the firing door is required as with soft coal."

The results of a series of experiments made to determine the most efficient methods of using coke for domestic heating purposes are given in Technical Paper 242, which may be obtained from the Bureau of Mines, Washington, D. C.

THE OIL SUPPLY OF THE WORLD

In view of the present interest in the fuel-oil situation on the part of the heating industry, some figures given by David White, chief geologist of the United States Geological Survey, at a recent regional meeting of the local sections of the American Society of Mechancial Engineers, in Kansas City, Mo., are of special significance. Fuller details of his address appeared in *Mechanical Engineering* for September, 1922.

"To date," says Mr. White, "the United States has furnished nearly two-thirds of all the oil yet taken from the ground in the world—5.5 billions of barrels out of a total of 8.5 billions. Our American fields are now pouring out 62% of the world's annual supply, while our country is using over 75% of that total supply. In other words, the United States requires over 115 million barrels more than it produces; for, whereas our output now approximates 470 millions yearly, our requirements, even during the business stagnation of 1921, called for 525 millions.

"Everywhere, except perhaps in the Navy, the demand for even more oil is in evident prospect. Nothing can check the increase more than momentarily, except high prices due to scarcity of oil or high costs of production or importation—that is, the greater expense of obtaining the oil."

Speaking of the economic future as to oil in the United States Mr. White called attention to the recent estimates of oil reserves of the United States by States or regions, made by a body of competent experts and published by the director of the Geological Survey:

ESTIMATED OIL RESERVES OF THE UNITED STATES BY STATES OR REGIONS.

	Millions of Barrels.
New York	100
Pennsylvania	260
West Virginia	200
Ohio	190
Indiana and Michigan	70
Illinois	440
Kentucky, Tennessee, northern Alabama and northeastern Mississippi	175
Missouri, Iowa, North Dakota, Wisconsin and Minnesota	40
Kansas	425
Oklahoma	1340
Northern Louisiana and Arkansas	525
Texas, except Gulf coast	670
Gulf coast, Texas and Louisiana	2100
Colorado, New Mexico and Arizona	50
Wyoming	525
Montana, Nebraska and South Dakota	100
Utah, Nevada, Oregon, Washington and Idaho	80
California	1850
Eastern Gulf coast coastal plain and Atlantic coast States	10
Total	9150

Of the 9 billion barrels which, as of March 15, 1922, should remain in the ground recoverable by present methods, it is pointed out that rather more than 4 billion barrels belong to the heavy group containing the fuel-oils. Of the class containing the lighter oils, about 725 million barrels are believed to remain in the Appalachian States and 40 million barrels in the Lima-Indiana region. The fuel-oils are largely to be found in the Pacific Coast, the Rocky Mountain and the Gulf States.

The co-operative committee expressly affirms—and it is well known in the profession—that not all the oil pools in the United States will have been discovered a generation hence. On the other hand, the committee takes great care to point out that while our reserves would not meet our present rate of consumption demands for 20 years, if they could be taken out of the ground fast and cheaply enough to supply our market (a conditioning clause that has generally been lost sight of by the press and the public), this country will be producing oil for as long as 75 years to come.

WHEN THE OIL-PRODUCTION PEAK WILL BE REACHED.

Most geologists believe, says Mr. White, that within a few years, perhaps less than five, we shall in the normal course enter on a period of waning fields in increasing number, with discoveries more infrequent and in general more costly. He adds, however, that the date of passage of the peak depends largely on the demand for oil and the reflected oil prices. "If supplies from foreign sources continue adequate and cheap for a long time," he says, "the passage of the peak may be ins sible

FUEL OIL DATA

Pounds and Gallons Conversion Factor.—When speaking of oil consumption the pound is very often used as a basis of measurement. There are approximately 7.3 lbs. in a gallon of the lighter grades of fuel-oil (30° to 33° Baumé), gas-oils or distillates.

B. T. U. in Oil.—Kerosene, 20,000; gas-oil, 19,200; fuel distillate, 19,400.

Baumé is used in the petroleum industry to designate the gravity of oil. Gravity is expressed as degrees Baumé. There are two Baumé scales, one for liquids lighter than water and one for liquids heavier than water. When testing the Baumé of an oil the lighter scale must be used.

Hydrometer Tests.—Baumé tests are made with a hydrometer designed expressly for testing petroleum oils (lighter than water) and may be made by anyone without difficulty.

Flash-Point of an Oil.—The temperature at which it vaporizes and will "flash" when brought into contact with flame The flash point of the fuel-oils (30° to 33° Baumé) is of underwriters' specifications which are 175° F. open-cup test. Kerosene flashes at about 125° F.

Oils, Crude, Distillate, Fuel.—Crude oil is the oil in its crude state as it comes from the earth. This is valuable and seldom used for fuel purposes. It is first "cracked" or "distilled" and the gasoline taken off, then a further cracking or distilling takes off the kerosene. This is followed by other processes resulting in many products, among them distillate, and the residue—fuel-oil. The lighter grades of fuel-oil (30° to 33° Baumé) are preferable for home heating as they are but slightly affected by low temperatures, and require no preheating.

Boiler Rating in Relation to Fuel Consumption.—The square feet rating of a steam boiler divided by 50 will give the necessary number f pounds of oil to be burned in order to secure the maximum efficiency. To illustrate, a 2000-sq. ft. capacity boiler will require 40 lbs. of oil an hour at rating.

Firebox.—To burn without smoke, the firebox should have ½ cu. ft. of volume for each pound of oil burned per hour. All standard boilers have this capacity, but special attention should be given to the fireboxes of boilers to be converted from gas to oil.

Cost Comparisons.—One ton of coal at $13.25 compares with 100 gal. of oil at 8 cents per gallon ($8.00), under good conditions, or 135 gal. of oil @ 8 cents per gallon ($10.80). In some cases where carelessness has been the rule with coal, 100 gal. of oil will be the heating equivalent of a ton of coal, while in other cases where boilers have been efficiently handled with coal, it will be necessary to burn 135 gal. of oil to secure the heating equivalent of a ton of coal.—*From a leaflet issued by the Caloroil Burner Corporation.*

though early, but should they be seriously curtailed or largely cut off for a considerable period in the near future we probably shall then see our operators driven by high prices to the greatest maximum."

CONDITION OF THE MEXICAN OIL WELLS.

According to Mr. White, the present production in Mexico, amounting to about 195 million barrels in 1921, is mostly drawn from a relatively small number of wells located along a single axis of folding in which a thick limestone, the Tamosopo, is caverned by solution and, in the structurally high points, gorged with gas and oil under most tremendous pressure of salt water. No wells of such enormous production are known in any other part of the world.

It is common knowledge that most of these wells have gone or are now going to salt water, and on the basis of this fact as differentially interpreted in the light of other geologic conditions in the field it, is believed by many oil geologists, including some of high repute, that the greater part of Mexico's present phenomenal production is on the verge of approximate extinction.

It is practically certain, states Mr. White, that, while some new discoveries of Tamosopo oil may come to the aid of the rapidly failing pools, sooner or later the production of oil from the world-record-breaking Tamosopo limestone gushers will wane, and the remaining portion of Mexico's 4 to 5 billion barrels of oil reserves, as estimated, must be won by the sweat of the oil operator's brow from wells of the ordinary type.

ENDORSES DEVELOPMENT OF OIL-SHALE INDUSTRY.

"The development on a commercial scale of an oil-shale industry," declares Mr. White, "deserves earnest and wise consideration. Naturally there will be waste and loss of this shale through mining first the richest beds, just as takes place in our coal fields. As has been pointed out by Requa and others, the production of oil from oil shales is a matter of mining and retorting ton by ton and predicates the gradual building up of an industry which, to replace one-third of our present petroleum output, would require men, cities, mining plants, machinery, transportation, water, etc., roughly equal to one-third of our bituminous-coal-mining industry. It is a gigantic task requiring years and enormous capital.

"Above all it requires planning through research, through experimentation, and through patient trial on a commercial scale, with the closest attention by engineers of all kinds to costs as well as products, with the object of placing the industry on a successful basis as a going concern as soon as prices of crude petroleum and conditions as to prospective supplies permit. Studies should be made to show what prices for crudes of different grades will justify the systematic development, in different regions, of oil-shale production.

Shale oil, by which is meant artificial petroleum obtained by distillation of oil shale, may be looked forward to as a stabilizer of domestic prices as well as an economic backstop in oil. Eventually, and especially as foreign supplies available to the United States becomes scarcer or too costly, it should guarantee our ultimate independence in oil, and, to this extent, our industrial and social prosperity as well."

METHODS OF HEATING FUEL OIL

(From the 1922 Report of the Prime Movers Committee of the National Electric Light Association).

The increasing use of oil as fuel for industrial and power purposes has resulted in rapid strides in the development of mechanical equipment necessary for efficient handling and burning of the oil. One of the most important devices used in connection with a fuel-oil burning set is the fuel-oil heater. In order to properly atomize the oil at the burner, it is necessary to heat the oil to such a temperature that its viscosity will be reduced to a point where the oil can be easily and efficiently atomized for introduction into the furnace. It is usually necessary to heat the oil to a temperature where its viscosity is about 3° to 5° Engler. With light oils, temperatures of 220° F. or lower, depending upon the specific gravity of the oil, will produce the desired results. With heavy oils, temperatures as high as 300° F. may be required. The following table indicates approximate temperatures of various grades of oils necessary for efficient atomization in mechanical types of burners:

Degrees Baumé of Oil	Approximate Temperature of the Oil, Deg. F.
30	140
28	150
24	160
20	170
18	200
16	230
14	260
12	280
10	300

Note: These temperatures are approximate as the desired temperature may vary, depending upon the type of burner used and the characteristics of the fuel-oil.

For oils having gravities up to approximately 20° Baumé exhaust steam may be used for heating the oil, for heavier oils live steam should be used. The oil is

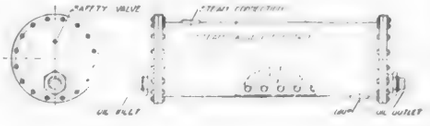
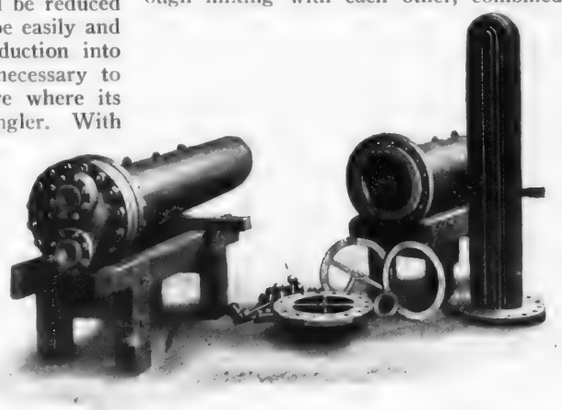


FIG. 1—COIL TYPE OF FUEL-OIL HEATER.

usually heated to the proper temperature by means of a fuel-oil heater, the heating agent being exhaust or high-pressure steam, depending upon the conditions. The fuel-oil heater is usually installed in the system between the oil pump and the furnace.

CHARACTERISTICS OF FUEL-OIL AFFECTING ITS HEATING.

The characteristics of fuel oil are such that it is a very difficult fluid to heat, the viscosity of the oil being the major factor affecting the ease of heating. This tendency of the oil particles to adhere to each other and to resist breaking up into smaller particles necessary for a thorough mixing with each other, combined



TYPE OF FUEL-OIL HEATER DESIGNED FOR LARGE CAPACITIES.

with the difficulty of keeping the heater oil joints tight, the high pressures used in certain types of installations and the high steam pressures required to heat the oil, necessitates the utmost care in the design of the fuel-oil heater.

It is the usual practice to design fuel-oil heaters so that the oil will be confined to the inside of the heating element, the steam being in the shell around the tubes or coils comprising the heating element. This operation may be reversed, but our experience has indicated that the oil-tube type of heater is more satisfactory than the steam-tube type, both from the design and operating point of view.

DIFFERENT TYPES OF HEATERS REQUIRED FOR SMALL AND LARGE QUANTITIES OF OIL.

In order to determine the best types of apparatus for fuel-oil heating purposes, the Whitlock Coil Pipe Company has carried on extensive tests using different materials in the heating elements, in connection with different types of oil-tube heaters, with different grades of fuel-oils. The results obtained indicate that two types of fuel-oil heaters are necessary in order to handle all conditions of oil capacities—a coil type of heater adapting itself best to small quantities of oil, and the multi-pass tubular type of heater being best for conditions where the quantities of oil are large.

ESSENTIAL FEATURES.

The essential features of a well-designed fuel oil heater may be listed as follows:

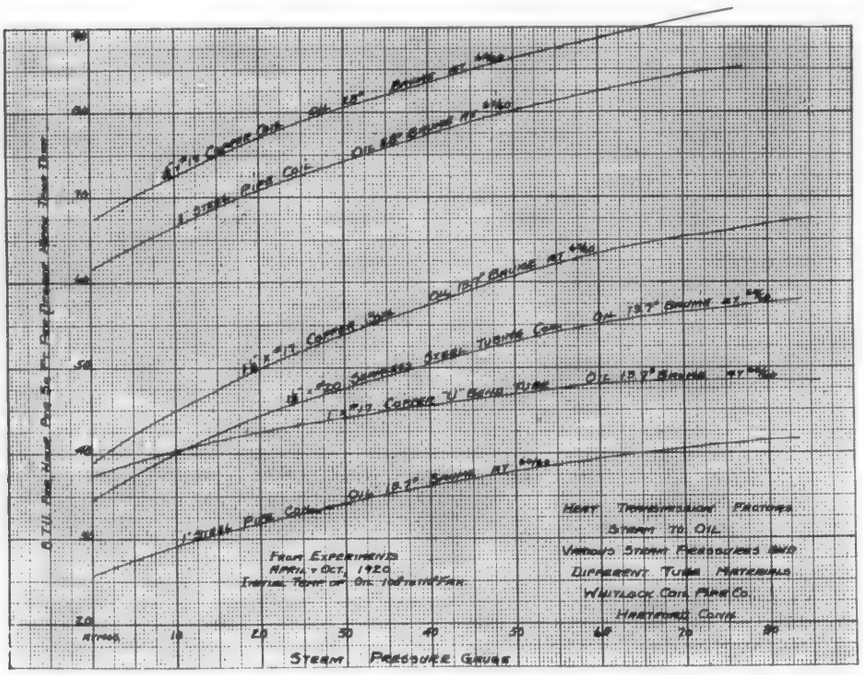

B.T.U. Per Hour Per Sq. Ft. Per Degree Mean Temp. Diff.
Steam Pressure Gauge
From Experiments April to Oct. 1920
Heat Transmission Factors
Steam to Oil
Various Steam Pressures and Different Tube Materials
Whitlock Coil Pipe Co.
Hartford Conn.

FIG. 3—HEAT TRANSMISSION CURVES FOR WHITLOCK FUEL-OIL HEATERS.

1. All oil joints should be external.
2. All oil joints in the heater should be eliminated if possible.
3. If oil joints are necessary, the number should be reduced to the minimum.
4. The entire heating section should be easily accessible and removable.
5. Extreme care must be used in the selection of materials used in the manufacture of the heater.
6. The heater must be capable of withstanding very high pressures and temperatures and must be so designed that temperature strains are properly compensated for.

Fig. 1 illustrates a coil type of heater, which can be installed in either a horizontal or vertical position and which can be used for all conditions of operating pressures on both the steam and oil sides. The coil-type of heater is not recommended for large oil capacities, due to the fact that when handling large quantities of oil, the cross section area of the oil passages is larger than can be easily obtained with a coil-type construction. When the number of coils necessary in this type of heater passes a certain point, the design of the heater is complicated considerably and the cost of construction is prohibitive.

Construction: Shell—steel pipe, ends reinforced and flanged as shown; heads—steel; heating element — extra-heavy wrought-iron or steel pipe or seamless steel tubing; headers—when necessary cast steel, with coil terminals welded into the headers.

Note that in this type steam and oil joints are external. There are no joints inside of the heater. This heater can be used in connection with both low and high-pressure systems. Where high-pressure steam is used, the end of the shells are reinforced with extra-heavy steel flanges.

Fig. 2 indicates the construction of the Whitlock Type "R" fuel-oil heater. It can be installed in either a horizontal or vertical position and is adaptable where the oil capacities are in excess of about 1000 gal. per hour.

This type of heater is known as a U-bend type, which reduces the number of expanded joints necessary to a minimum and provides a heating section removable and easily accessible.

Construction: Shell—steel pipe, one end rolled in and welded, the other end Van-Stoned with extra heavy steel flange as shown; tube sheet—steel; oil chamber—cast-steel or cast-iron; heating element—small-size heavy-gauge seamless steel tubing, expanded into the steel tube sheet.

The heater is designed for high oil and steam pressures and large quantities of oil. When used for low-pressure work, a cast-iron shell flange is used with cast-iron oil chamber.

In order to illustrate the importance of the proper selection of the material used in the heating element of the fuel-oil heater, the curve shown in Fig. 3 will prove interesting. The efficiency of the heating element is expressed in B. T. U. transmission per square foot of surface per mean degree temperature difference and is plotted against various steam pressures. The effect of the viscosity of the oil is clearly illustrated,—the lighter the oil the more effective the heating surface and the lower the steam pressure necessary to accomplish the desired results. These curves are plotted for identical operating conditions. It will be noted that there is considerable difference in the heat transfer possible with different materials.

Where it is necessary to use live steam, it is advisable to use as high a steam pressure as possible, which results in reducing the size of the heater to a minimum.

With reference to the material used in the heating sections of the fuel-oil heaters, it has been found that wrought-iron or steel pipe or small size seamless steel tubing is the most satisfactory material for this purpose.

OPERATING SUGGESTIONS.

The following diagram (Fig. 4) illustrates the essential features of a fuel-oil heater installation. The major precaution is to always protect both the heating section and the heater shell by means of safety valves properly attached.

The importance of eliminating shut downs of boilers using fuel-oil is usually such that it is advisable to always install duplicate fuel-oil heaters, one unit to be used as a spare. This procedure will eliminate boiler shut downs in the event of the necessity of cleaning or overhauling one of the fuel-oil heaters.

When making up the oil connections to these types of heaters provision should be made to install a relief valve in the oil line between the heater and the stop or by pass valves as indicated in the diagram of connections. This procedure will eliminate the possibility of rupture of the heating element due to expansion of oil in the heater caused by leaving the steam turned on, with the heater by-passed on the oil side.

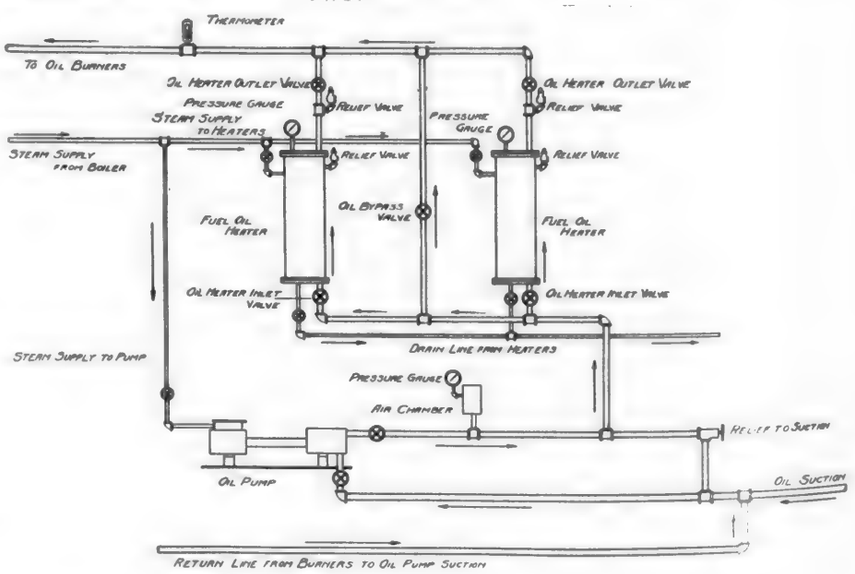


FIG. 4—DIAGRAM FOR TYPICAL FUEL-OIL HEATER INSTALLATION.

Connect the steam line to the heater where indicated and make sure that the drain connection is properly made and the drain line provided with a free opening.

When starting up the heater, open the steam valve slowly, at the same time allowing the oil to circulate through the heater until it is heated to the desired temperature, then close the circulating line and open the steam valve as necessary to maintain the required temperature with the burners in operation.

Due to the tendency towards the use of heavy oils for fuel-oil firing purposes, it is advisable to purchase a fuel-oil heater capable of handling the heaviest grades of oils obtainable. This procedure provides a heater which may be used with any grade of oil, irrespective of whether it may be a light or a heavy fuel-oil, and enables the user to purchase fuel-oil from any source of supply that conditions may dictate.

There are many plants operating which were originally designed to handle light fuel-oils, and when it is advisable to use heavier grades of fuel-oil, the heaters originally installed are usually found to be inadequate for heating the heavy grades of oils. In order to handle this situation, so called booster heaters of the same general types of design as discussed above are used, which are installed in the system between the oil burner and the original heater. This procedure eliminates the necessity of discarding the original units and replacing them with new heaters of larger size.

TYPES OF FUEL-OIL BURNERS FOR HOUSEHOLD USE

EDITOR'S NOTE.—*Under the general heading of "oil burners" will be included those which utilize not only fuel-oil, so-called, but also those adapted for gas-oil and kerosene-oil. This series of articles commenced in the September issue with the description of the Combustion fuel-oil burner.*

2—KLEEN HEET OIL-BURNING SYSTEM.

The burners used in the Kleen Heet system, manufactured by the Winslow Boiler & Engineering Co., Galesburg, Ill., are designed primarily to burn distillate, kerosene and the better grades of gas-oil. They are described as being able to handle any oil that remains fluid and that has a flash point of less than 200° F. Where a gas-oil of these qualities—with a gravity of from 34° to 36° Baumé—is obtainable, it is to be preferred; where it is not available, distillate or kerosene-oil of practically any quality is used. The apparatus consists of a motor, blower, vacuum pump, automatic electric valve and fire-pot, together with the necessary thermostat, electric control box, Stewart vacuum feed and other attachments to make it automatic.

As is well known, in order to secure the highest degree of combustion of oils, it is necessary to artificially force a mixture of the oil and air. As this cannot be done while the oil is in a liquid state, it is necessary to turn it into a vapor or gas before the mixture can be made. It is also important that the amount of air and oil vapor be in the proper proportions and that the mixture of the two be thorough. It is further necessary to maintain an extremely high temperature to get complete combustion. The manufacturers of the Kleen Heet burner state that the most successful and direct way of accomplishing this vaporization and thorough mixture is to vaporize the oil in the combustion chamber where the vaporization process is conducted under the most intense heat, in an open chamber, where carbon is least apt to accumulate.

In the Kleen Heet system, the oil is delivered to the firepot directly by a ¼-in. pipe projecting into the combustion chamber. The burner has no nozzles or atomizers. The firepot is designed to confine the air and oil vapors until they have been thoroughly mixed. This accounts for the shape of the pot which is arranged so as to cause the air currents to swirl directly over the vaporizing surfaces. In the standard size burner commonly used for residences, the firepot is made of cast-steel, but in the larger sizes, a lining of special fire-resisting material is used, with silicon as its basic element.

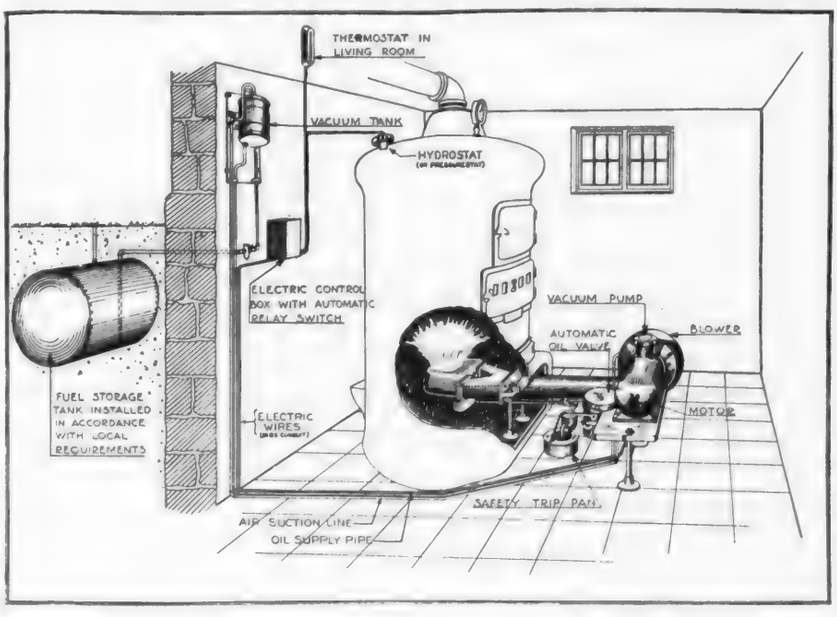
As the oil enters the combustion chamber it drips from the pipe to the vaporizing plate below. Underneath the vaporizing plate is a gas pilot light which serves both as a heater to keep the vaporizing plate warm enough to vaporize the dripping oil, even before the firepot becomes heated, and also as ignition for the gas and oil vapors.

The fact that an unusually large air tube is used to conduct the air from the fan to the firepot is mentioned as contributing to the burner's noiseless operation, since there is no high-pressure blast. This also serves to reduce the possibility of the pilot light being extinguished.

It will be seen from the foregoing description that the firepot is the heart of the Kleen Heet burner. The rest of the mechanism is incidental to the requirements of this firepot. In connection with the mechanism mounted outside of the boiler, it should be noted that the motor drives a Sirocco fan which furnishes the air. This, in turn, is regulated by a damper in the air line. The vacuum pump is housed in the same casting with the motor, this pump being used to create the necessary vacuum in the small vacuum tank. This pump is of the reciprocating piston type, while the motor is described as a heavily constructed type, with a comparatively slow speed of 1750 R. P. M. It is rated at ⅛ H. P. in the standard (residence size) burner, and in the larger burners it is built up to ¼ H. P. Its load is about 3 amperes and its current consumption approximately 110 watts.

What is characterized as a unique feature of the Kleen Heet burner is the automatic valve for oil control. The valve proper is of the blunt needle type, ground into its seat to form a perfect fit. The valve stem is attached to a cast-iron disc. A magnet, placed above and on the outside of the valve chamber, lifts the disc against gravity and opens the valve whenever current is passed through its coils. The magnet and motor are connected in multiple to the main line switch and when the thermostat causes this switch to be closed it acts to start the motor, causing the magnet to pick up the disc and needle valve, and thus open the oil supply to the combustion chamber.

The valve is normally closed. To further insure safety the system includes a device consisting of a drain pipe from



INSTALLATION OF KLEEN-HEET OIL-BURNING SYSTEM.

the firepot to a small brass cup suspended from a trigger arm, so arranged that if oil should enter the firepot and fail to be consumed, the excess oil would drain into this cup. The weight of a few ounces is sufficient to cause the trigger to be released and to shut off the motor and oil valve.

Automatic electric control is secured through the use of a standard thermostat mounted in one of the living rooms and a standard relay switch with a small transformer which is mounted in a sheet-steel cabinet and usually located on a basement wall near the burner. This control is for use with alternating current and another arrangement is provided for direct current.

The fact that the Kleen Heet system uses a vacuum system of oil feed is mentioned as one of its important advantages. A standard vacuum tank is used, mounted upon a wall of the basement, 5 ft. or 6 ft. above the firepot level. The function of this tank is to furnish a non-siphoning break between the main fuel reservoir and the burner, and to keep a small supply of oil in reserve and at a constant altitude for delivery to the burner. With the oil maintained at a fixed level in this vacuum tank, it is possible to maintain a constant head pressure on the oil running directly through the automatic valve into the combustion chamber and thus insure a uniform flow of oil.

In connection with the oil consumption which may be expected with this apparatus, the manufacturers state that with oil at 10 cents a gallon and hard coal at approximately $17.00 a ton delivered, the average cost of burning oil will be found to be about 10% less than that required for coal.

Facts Regarding the Supply of Fuel-Oil.

Several newspaper reports have come out recently to the effect that fuel-oil will not be as plentiful as many expect. One of these reports was published on the authority of the Standard Oil Company and reads as follows:

STANDARD OIL COMPANY AROUSES HEATING EXPERTS.

"'Thousands of inquiries from householders who think they can burn fuel-oil instead of coal have been received by the Standard and other producers and refiners of petroleum. The answer is that it would be virtually impossible. In the first place, the ships have the first call on fuel-oil. Then the future supply is uncertain, owing to the steadily diminishing output from Mexican fields. Moreover, it would be very costly to equip a big hotel or apartment house or dwelling to burn fuel-oil.'

"The newspaper dispatch then recounts the difficulties of reducing the viscosity of fuel-oil to the point where it could be utilized. A low grade kerosene was named as the most practical fuel and Diesel oil in general was by indirection endorsed for the purpose."

"The article," writes one of our correspondents, "if actually inspired by Standard oil interests, is readily explained. The Standard Oil Company, it seems, does not retail fuel-oil, nor does it sell it in quantity, except in unusual times when by some mischance it is heavily overstocked. In that case, as immediately after the war, the company unloaded vast quantities on coal users near tide water, which led to disappointment later on after the temporary surplus became exhausted.

LARGE PRODUCTION OF KEROSENE.

"It is reported that the Standard Oil Company of Indiana has no fuel-oil for sale as this company cracks it to the limit, leaving only road-oil and petroleum coke which nets more than would the sale of fuel-oil. The company has a large production of kerosene, however, which it is anxious to sell at about double the price of fuel-oil. This explains the condemnation of fuel-oil and the boosting of 'low-grade kerosene.' Fortunately, the Standard Oil Company does not control the fuel-oil market, nor the scope of development of oil-burning apparatus."

Making a Pipe Flow Formula Easier to Use.

No doubt most of our readers who have had to compute water pipe sizes know that a commonly accepted formula for computing the friction loss of water in pipes is

$$h = \frac{0.8\ V^{1.86}}{d^{1.25}}$$

where h = the loss on head in ft. per 1,000 ft. of pipe.
V = velocity of water in ft. per sec.
d = diameter of pipe in ft.

This formula is a good one but at the same time it is rather difficult to use on account of the exponents 1.86 and 1.25 What is even worse, however, is the fact that the pipe diameter is given in "feet" rather than in inches. Most of us have trouble enough with plain logarithms, let alone co-logs and other complications. So, to compute a one-inch pipe we first have to convert the inches to feet, which is usually less than one, and to find the logarithm of a number less than one is apt to confuse.

The writer has therefore converted the formula into more usable form as follows:

$$h. = \frac{8.47\ V^{1.86}}{d^{1.25}}$$

where the factors are all the same as named above with the exception that d = diameter of pipe in inches. W. F. SCHAPHORST.

Building and Contracting Leaders Choose Basic Books of Industry.

The selection of the basic books in the building and contracting industry, which has been undertaken by L. M. Boomer, manager of the McAlpin Hotel, New York, for inclusion in the business library of the hotel, has now been completed. Among those who gave their selections, from which the final choice will be made, are: W. H. Driscoll, vice-president of the Thompson-Starrett Company, New York; Ralph Collamore, Smith, Hinchman & Grylls, Detroit, Mich.; Reginald P. Bolton, the R. P. Bolton Company, New York; and W. T. Timmis, Timmis & Chapman, New York. These selections came to Mr. Boomer as the result of an inquiry instituted among the leaders in the building and contracting industry to assist him in building up a business library of the ten books in each of twenty industries selected by the leaders of those industries.

Mr. Timmis chose:
Pocket Companion—Carnegie Steel Co.
Mechanical Engineers' Pocket Book....Kent
Mechanical Equipment of Buildings
Harding and Willard
Vol. I. Power Plants and Refrigeration
Vol. II. Heating and Ventilation
Fan Engineering—Buffalo Forge Co.
Electrical Engineers' Pocket Book.....Foster
Sweet's Index—Architectural & Engineering
Useful Data—Corrugated Bar Co.
Steam Power Plant Engineering....Gebhardt
Heating & Ventilating Engineer's Guide
Modern Plumbing .....R. M. Starbuck

Mr. Collamore chose:

ARCHITECTURAL.

Edifices de Rome.....Letarouilly
Gothic Architecture in England.....Pugin
Athens Antiquities.....Stewart & Revette
Orders of Architectur.....Vignola
English Homes .....Ratham
Renaissance in England.....Gotch
History of Architecture.....Ferguson
Italian Rennaisance ..... Schutz
Monograph of work of McKim Mead & White
Architects & Builders Hand Book.....Kidder

ENGINEERING.

Mechanical Equipment of Buildings
Harding and Willard
American Civil Engineers Pocket Book
Merriman
Structural Engineer's Hand Book....Ketchum
Mechanical Engineer's Hand Book.....Kent
Concrete Engineers Hand Book....
Hool and Johnson
Standard Handbook for Electrical Engineers
McGraw Hill Book Co.

Mr. Driscoll chose:

HEATING AND VENTILATING.

Heating and Ventilating Engineer's Guide 1922—
American Society of Heating and Ventilating Engineers
Mechanical Equipment of Buildings, Vol. I, Heating and Ventilating..Harding and Willard
Handbook for Heating and Ventilating Engineers ..... Hoffman
Heating and Ventilating
John R. Allen and J. H. Walker
Steam Heating..... Warren Webster & Co.

ELECTRIC WIRING.

Hawkins Electrical Guide—10 Volumes
Library of Practical Electricity..8 Volumes
Croft
Standard Handbook for Electrical Engineers
McGraw-Hill

PLUMBING.

Handbook on Plumbing.....Dibble
Standard Practical Plumbing..R. M. Starbuck
Modern Plumbing (Illustrated) R. M. Starbuck

MISCELLANEOUS MECHANICAL EQUIPMENT.

Compend of Mechanical Refrigeration and Engineering ..... Siebel
Principles of Mechanical Refrigeration
Macintire

Mechanical Equipment of Buildings (Vol. 2) Power Plants and Refrigeration Harding & Willard
Mechanical Equipment of Federal Buildings Thompson
Mechanical Engineers' Handbook.....Marks

BASIC BOOKS IN HEATING AND VENTILATING AND PLUMBING INDUSTRIES.

The basic books in the heating and ventilating and plumbing industries were selected by Nelson S. Thompson, chief mechanical and electrical engineer, Office of Supervising Architect, U. S. Treasury Department; J. A. Almirall, president of Almirall & Co., Inc., New York; Director F. Paul Anderson of the A. S. H. & V. E. Research Laboratory; W. H. Carrier, president of the Carrier Engineering Corporation, Newark, N. J.; F. G. McCann, chief of the Division of Heating and Ventilating, New York City Department of Education; William H. McKiever, New York; Professor A. C. Willard, of the University of Illinois; W. K. Simpson, secretary of the Hoffman Specialty Co., Bridgeport, Conn.; J. D. H. Wiman, Department of Practical Mechanics, Purdue University, Lafayette, Ind.; and H. M. Harris, of the Bishop & Babcock Co., Cleveland, O.

MR. ANDERSON chose:
Public Health & Hygiene.....W. H. Park
Civilization and Climate...Ellsworth Huntington
Mechanical Equipment of Buildngs, Vols. 1 and 2 Harding and Willard
Heating and Ventilation.....Allen and Walker
The Theory of Heating and Ventilating A. H. Barker
Plumbers' Handbook.....S. E. Dibble
Heating and Ventilating Guide, A. S. H. & V. E.
Steam Heating
Fan Engineering

MR. McKIEVER chose:
Transaction of the American Society of Heating and Ventilating Engineers.
1922 Guide of the American Society of Heating and Ventilating Engineers.
Engineers' Pocketbooks Kent and Marks and Trautwine
Mechanical Equipment of Federal Buildings Thompson
Mechanical Equipment of Buildings Harding and Willard
Steam Power Plants.....Henry C. Meyer, Jr.
Designing Heating and Ventilating Equipment Charles A. Fuller
Central Station Heating.....Gifford

MR. THOMPSON chose:
Mechanical Equipment of Buildings Harding and Willard
Heating and Ventilating.....Allen and Walker
Designing Heating & Ventilating Systems Fuller
Heating and Ventilating of Buildings R. C. Carpenter
Central Station Heating.....Gifford
District Heating.....Bushnell
Steam Power Plants.....Meyer
Heat as a Mode of Motion.....John Tyndall
Proceedings of the Heating and Ventilating Engineers Society for the last five years.
Proceedings of the National District Heating Association for the last five years.

MR. HARRIS chose:
Designing Heating & Ventilating Systems Charles A. Fuller
Heating and Ventilating Buildings Prof. R. C. Carpenter
Hand Book for Heating and Ventilating Engineers.....J. D. Hoffman
Mechanical Equipment of Buildings, Vol. 1, Heating and Ventilating..Harding and Willard
Heating and Ventilation John R. Allen and J. H. Walker
Mechanical Equipment of Federal Buildings Nelson S. Thompson
Encyclopedia of Engineering, which contains 7 volumes, put out by the American Technical Society.

PROFESSOR WILLARD chose:
Heating and Ventilation.....Allen and Walker
Mechanical Equipment of Buildings, Vol. 1 Harding and Willard
Heating and Ventilating Buildings....Carpenter
The Principles of Heating.....Show
House Heating by Steam and Water..Thompson
Heating and Ventilation.....Greene
Fan Engineering
The Guide, A. S. H. & V. E.
Handbook for Heating and Ventilating Engineers ..... Hoffman

New York State's Fuel-Rationing Law.

Probably the most far-reaching law so far enacted in any State bearing on the present coal emergency is that passed by the New York State Legislature, August 29. This law embodies the provisions advocated by Governor Miller as necessary in the present coal emergency.

The administrator (Mr. Woodin) is appointed by the Governor and is given authority to control the receipts, storage, purchase, sale, use and delivery of fuel, according to the needs of localities and consumers, both public and private. He may buy and sell fuel, for both public and private consumption, may fix prices for various localities, and can parcel out the supply as he sees fit. He may also prescribe rules to prevent waste of fuel, and may regulate the production of heat, light and power, no matter how they are generated.

CONTROL OF SUPPLY.

The administrator may allot any coal coming into the State, and may search any premises where he has reason to think fuel is being hoarded, and may seize any such hoard and sell it to the public at prices he fixes. He may take possession of any supplies held by or contracted for by any manufacturer or dealer, in excess of his reasonable requirements, and any coal held for the purpose of raising the price.

CONTROL OF DISTRIBUTION.

Every dealer is obliged to furnish the administrator with a list of every purchaser of coal, with the kind, quantity and price. The agents of the administrator are given access to all supplies and to all records dealing with sales. The dealers may also be required to take out licenses from the administrator, who would prescribe the rules and regulations governing the licenses, including all terms and conditions of sales of coal. Licenses may be revoked for profiteering or unfair practices; and a penalty of a fine of from $100 to $1,000 or a prison term of not over one year or both for violating any rule laid down by the administrator, is imposed. If it is a corporation or association that violates the rule, the corporation is to pay the fine and any one of its officers is made subject to the term of imprisonment.

CONTROL OF PRICES.

The administrator may determine the maximum price that may be charged for each grade of coal. He is to determine what price will give dealers a fair profit, according to varying conditions, and in the different localities. $10,000,000 is appropriated for the purposes of the act.

OTHER PROVISIONS.

The administrator may suspend the school sessions in any locality where the fuel shortage makes it necessary, but the salaries of all persons connected with the State Department of Education would continue in such a case. State laws requiring municipalities and townships to advertise for bids on coal are set aside, and cities and other localities may, under the authorization of the administrator, issue certificates of indebtedness to pay coal bills. Municipalities are also authorized to pass ordinances suspending the use of electric signs or street lighting.

Faults in a Heating System.

Some hints on things to avoid in designing a heating and ventilating system are given in a report by Samuel R. Lewis, of Chicago, on a school building installation in a mid-western city. In his report he finds that the contractor put in the work according to the specifications.

"The plans and specifications," he states, "call for a simple duct, all blast system and also for a direct steam system. In other words, there are two complete heating plants for the building. The all blast part of the system as installed lacks one-fifth of having sufficient radiation, and the plant so operated would be in some difficulties, due to hot air ducts running uninsulated in cold attic spaces.

"The valves, unfortunately, are almost inaccessible and will require the construction of a ladder and platform.

"Every night unless the engineer crawls through the attic to these various isolated valves the aspirating radiation will be throwing its heat outdoors when no ventilation is needed, and will be drawing in cold air through every crack. There is no means of closing off the toilet ventilation. The heat lost through these aspirating coils at a conservative estimate will equal the cost of effective electric ventilation, which will be effective every day, hot or cold, and which will be cut off every night."

Comparative Cost of Various Heating Methods.

A writer in the *Portland. (Ore.) Journal*, who is evidently familiar with heating work, gives the following comparisons between the various types of heating installations:

In a general way the initial expense of the pipeless furnace is the least. Costs are increased with other systems in the following order: Piped warm air, steam heating, hot water and vapor. Of course the final cost is more important than the first.

As an example of these comparative first-costs, the pipeless furnace will approximate an expense of $125 to $150. The piped warm-air system will average somewhere between $250 and $325. The steam plant will cost approximately $300 to $375, and the hot water or vapor system will amount to $375 to $475. All of these figures are extremely variable.

NOVEL APPLICATIONS OF ELECTRIC HEATERS

BY T. W. REYNOLDS.

So many uses have been found for small electric heaters that their varied applications have assumed a prominent place in the catalogues of manufacturers of electrical equipment. The applications run all the way from keeping bees and chickens warm to the prevention of sewer traps from freezing (Fig. 1) and from the heating of elevators in cold warehouses to the liquefying of fuel-oil (Fig. 12). Probably the largest single application is to freight elevators in cold warehouses and moving cabs of outdoor cranes, hoists and railroad turntables (Fig. 2). The small size and flat shape of electric heaters make them particularly desirable wherever space is limited and safety required. They may be tucked away at night snug to the carburetor or hung beneath the engine of an aeroplane, keeping the water and oil warm while the machine is resting on the ground.

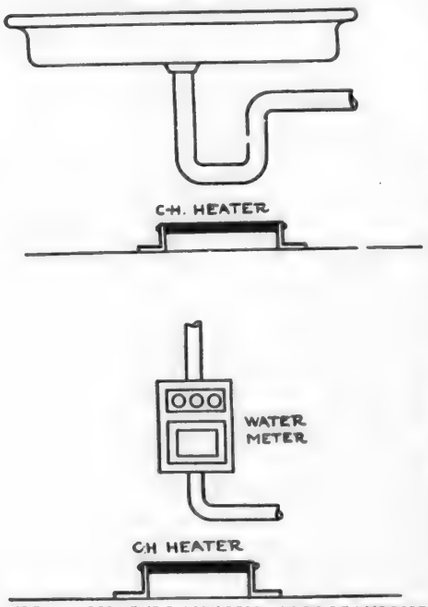


FIG. 1—MISCELLANEOUS APPLICATIONS

FIG. 2—METHOD OF MOUNTING AND PROTECTING ELECTRIC HEATERS IN A CRANE CAB.

MISCELLANEOUS APPLICATIONS.

Miscellaneous applications of this kind are usually interesting. One of the accompanying illustrations, (Fig. 4), for instance, shows how frost may be kept from show windows. Another illustration (Fig. 5) indicates a method of keeping food warm in caféterias. An arrangement of heaters for ticket booths outside of moving picture theaters is provided in the manner shown in Fig. 6.

For those who use sleeping porches a heater may be located under a bed on an outside porch (Fig. 7). Hung crosswise of this bed, about 2 ft. from the foot, it not only supplies a certain amount of warmth to the occupant of the bed, but also keeps the bedding from becoming damp and the bed springs from rusting.

Electric heaters have been found very satisfactory for heating underground bee houses or cellars, since nearly all other heating devices consume oxygen and in this way smother the bees. In chicken houses, brooders and incubators, they furnish a safe heat and keep the water troughs from freezing, thus doing away with the necessity for oil heaters and oil lamps, both of which give off gas and are liable to explode. The heaters may be arranged for thermostatic control and mounted as shown in Fig.8-9, using wire mesh as a protective covering.

FIG. 3—THREE ELECTRIC HEATERS USED FOR KEEPING AEROPLANE ENGINE WARM.

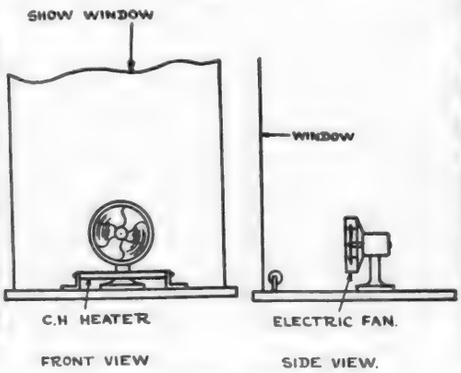


FIG. 4—KEEPING FROST FROM WINDOWS.

PREVENTING THE FREEZING OF AIR AND WATER LINES.

Keeping valves and piping of air and water lines open during the winter months is an application to which electric heaters are especially fitted. For instance, valves at the bottom of fuel-oil cars and water lines, even though frozen solid, may be thawed out by placing the heaters directly under the pipes or valves. Likewise, water collecting at the bottom of sump pits in coal hoists may be prevented from freezing, and in this way interfering with the action of the pumps.

Fig. 10 shows a specific application to an exposed water line, the exposure of which is increased at times by

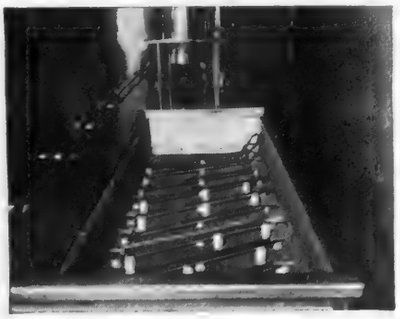


FIG. 5—SPACE HEATERS IN CAFETERIA SERVING COUNTER.

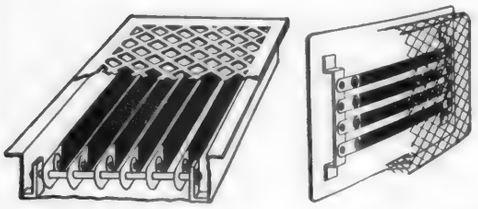


FIG. 6—APPLICATION OF ELECTRIC HEATERS TO FLOOR AND WALL AIR REGISTERS.

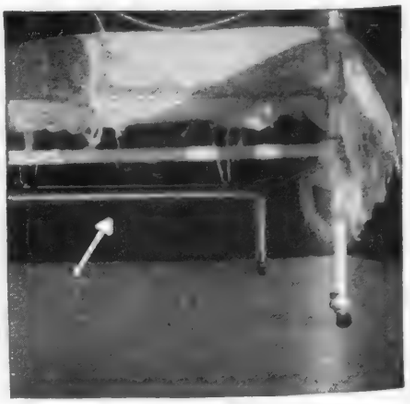


FIG. 7—HEATING SPACE UNDERNEATH BED ON OUTSIDE PORCH.

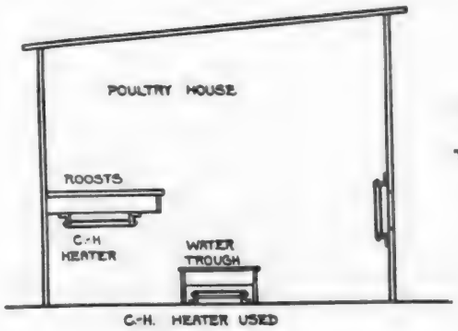


FIG. 8—SPACE HEATERS IN A CHICKEN HOUSE.

change in level of the river. The pump shown is located in a small isolated pump house where it operates at full capacity in the summer when the ice machinery is used, but in winter the small amount of water required causes the pump to be operated only about ten minutes of each hour.

The considerable difficulties experienced from freezing of this suction line were overcome by the use of electric heaters installed end to end in a section of galvanized pipe, as shown in the detail. The remaining spaces in this pipe were then filled with dry sand to increase the conduction of heat, after which the pipe was inserted in the suction line, the size of which was increased to obtain the same net cross sectional area as previously existed.

The heaters in this installation are connected all in multiple in very cold weather and four multiple sets of two in series for moderately cold weather.

In the case of air lines, formation of ice may be prevented by placing heaters at the proper point directly within the conveying line. This section of the pipe should be made of larger diameter, of course, than the conveying pipe, and should be equipped with baffles so as to insure passage of the air over the heaters. Insulated plugs should be used for passing the connecting wires through the pipe and into the heaters, the latter being set in spiders, also insulated from the pipe.

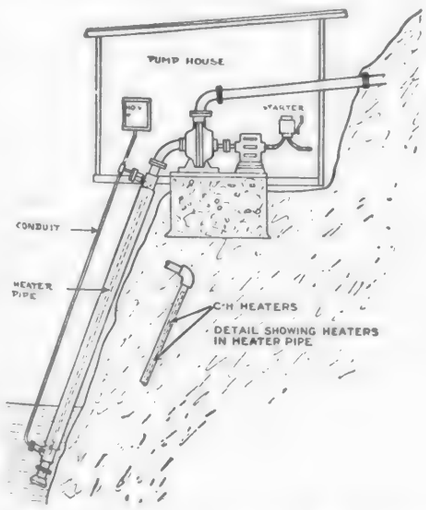


FIG. 10—SPACE HEATERS USED TO KEEP SUCTION END OF PIPE OPEN IN COLD WEATHER.

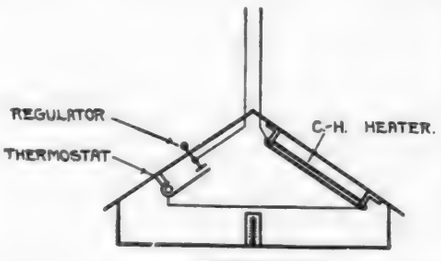


FIG. 9—ELECTRIC HEAT IN THE CHICK HOVER.

In electric water power plants, heaters are used for a number of purposes, such as the prevention from freezing of headgates, air-relief valves located along the penstock, and floats for operating head and tail race gauges. In the latter case, the heaters are installed directly within the cast-iron tubes, as shown in Fig. 11.

PREVENTING OIL FROM STIFFENING.

Very often it will be found impractical to use anything but electric heaters for heating the oil in such places as the bearings of motors, coal crushers and screens, dashpots of large scales, and gasometer switches of gas regulators.

Instances of trouble from stiffening of oil are many. In a certain steel mill the fuel-oil (at temperatures below 40° F.) could not be kept sufficiently liquid to pass through the fine strainer screen. This difficulty was overcome (as shown in Fig. 13) by placing three heaters on a spider half-way between the oil pipe and the surrounding jacket of asbestos pipe.

(To be continued)

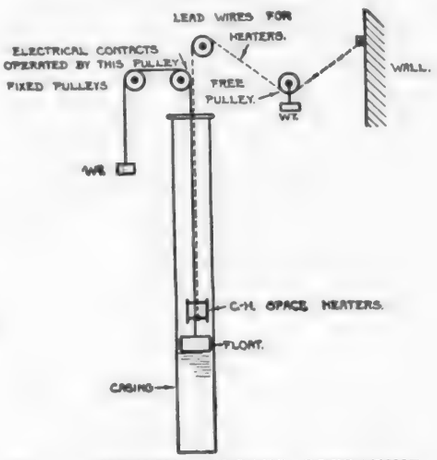


FIG. 11—KEEPING FLOATS OPERATIVE.

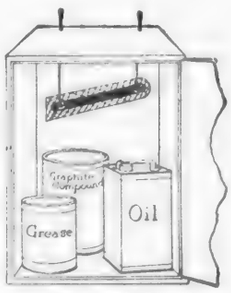
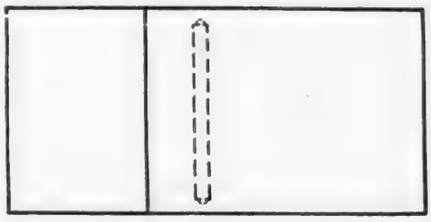


FIG. 12—KEEPING OIL AND GREASE FROM STIFFENING.



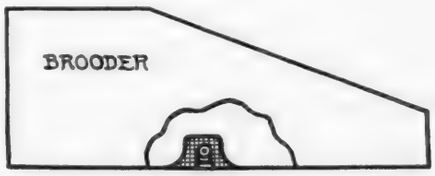


FIG. 9A—SPACE HEATERS FURNISH SAFE HEAT IN BROODERS.

Remarkable Refinements in a Heating and Ventilating System.

What is said to be the most up-to-date and complete ventilating system in the world, according to an exchange, is installed in the Council Chamber of the London County Council's chambers at Westminster, recently opened by the King. As described, its unique feature is that each member is able to control his own immediate atmosphere. He has a "control" button below his desk, so that if he is feeling cold he can make the air that is automatically fed to him a little warmer—or vice-versa—without upsetting his neighbor.

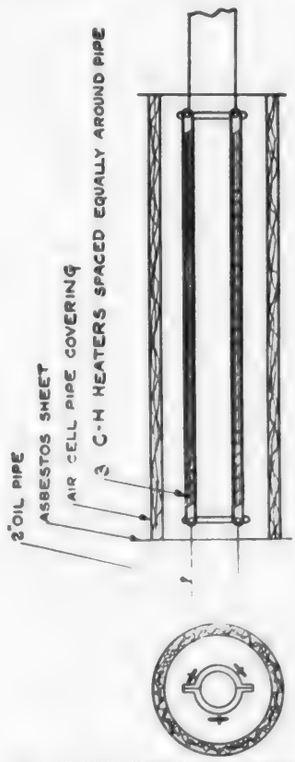


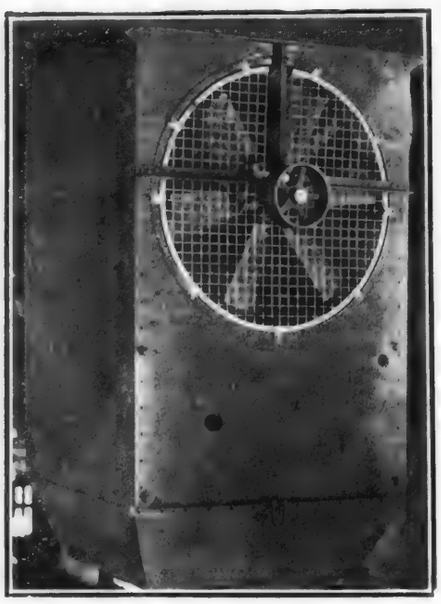
FIG. 13—SPACE HEATERS MOUNTED IN ASBESTOS CYLINDER.

PORTABLE UNIT FAN BLAST HEATERS

VI—STURTEVANT UNIT HEATERS.

Unit heaters, especially adapted for heating industrial buildings of one story in height and where the space is not divided by partitions, are now manufactured in an improved type by the B. F. Sturtevant Co., Hyde Park, Boston, Mass. In connection with this design, the company points out that a free circulation of air is necessary for the proper functioning of a unit heater system. Because the weight per square foot of area of the base is not in excess of the allowable weight per square foot of the usual factory floor, unit heaters can be placed on the floor and the foundations can be dispensed with. If the floor space is too valuable to use for the unit heater, it can be carried on the roof trusses.

Including steam and return lines, unit heaters will have a lower first cost installed than any other system using steam



STURTEVANT UNIT BLAST HEATER DESIGNED FOR ELECTRIC DRIVE OR BELT DRIVE.

or water. With all the air recirculated, the coal consumption will be as low as any other form of heater system, due primarily to the uniform heating that results and the absence of overheating the upper parts of the building, with the attendant excessive heat losses through the roof.

The power consumption of the unit heater fan used in Sturtevant unit heaters is so low that the power required for a large building will be but a small fraction of that required by a blast system with piping. Further, it will be lower than the power required by the pumps of a forced water heating system.

A further item of economy of operation lies in the fact that only the number of units required to heat a building need be in operation as the units must be capable of heating during the coldest weather. It is evident that they can be operated at reduced speeds or part of the units shut down during a large part of the time, as the average winter temperature is much above the minimum winter temperature.

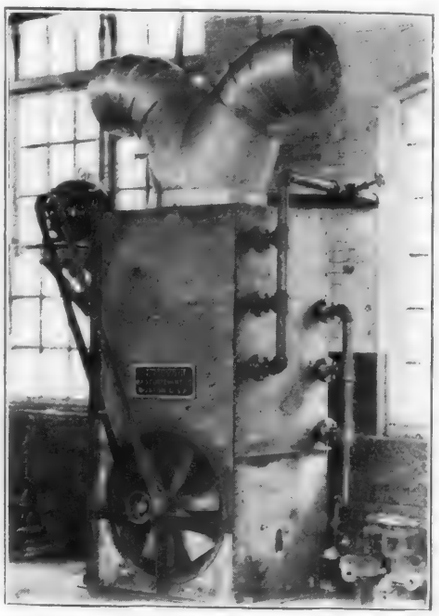
Where a building may be permitted to cool off at night the units are shut down. Sufficient heat will radiate from the units if the heat is left on to keep the building at a temperature sufficiently high to protect the sprinkler equipment.

DATA ON STURTEVANT UNIT HEATERS.

Size	250	425	625
Nominal Capacity CFM	6500	10000	15000
R. P. M. Fan	800	600	475
H. P. Motor, Nominal	¾	1	1½
Maximum Steam Supply, In. Diam.	2	2½	3
Maximum Drip, In. Diam.	1¼	1½	2
Final Temperature with 65° entering 5 Lbs. steam, Deg. F.	115	115	115
Weight without motor and outlet, lbs.	2500	3750	5050

As compared to the fan blast system with piping, the unit heater requires more pipe fitting in that supply and returns must be carried to each unit. In a large building requiring a number of units this means carrying the steam and return lines the length of the building. In the fan blast system there may be only one apparatus and it is only necessary to bring the steam and return lines to that apparatus which can be conveniently located.

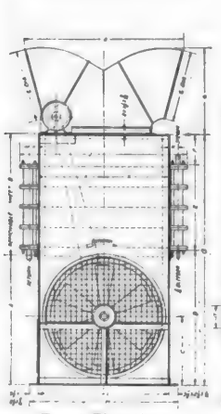
For buildings of a number of stories



TYPICAL INSTALLATION OF STURTEVANT ELECTRIC DRIVEN UNIT BLAST HEATER.

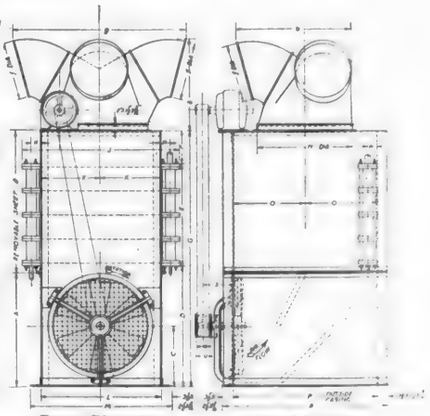
unit heaters are not so desirable as a fan system with piping. When used in a many-storied building stairways and elevators should be closed off to prevent their acting as chimneys.

DIMENSIONS OF STURTEVANT BELT-DRIVEN UNIT FAN BLAST HEATER.



Front Elevation Side Elevation

FIGURE 1



Front Elevation Side Elevation

FIGURE 2

Dimensions—All Dimensions are in Inches

Figure	Size	Wheel Dia	Shaft Dia	Dimensions of Heater A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	R	S
1	250	30	7/8	36	44½	19	38	32	10½	80½	3	50	19	38	45	30	23	46	53	7/8
2	425	39	1¼	48¼	44½	25¾	50¼	32	10½	92¾	3½	63	24½	49	56	36	28½	57	64	7/8
2	625	48	1¼	57½	44½	30⅜	59½	32	10½	102	3½	74	30	60	67	42	34	68	75	7/8

Figure	Size	Wheel Dia	Shaft Dia	Dimensions of Heater T	U	V	W	Dimensions of Elbow n		Dimensions of Two-Way Outlet c	d	e	Dimensions of Three-Way Outlet f	g	h	i		Steam	Return
1	250	30	7/8	7	5	4½	2½	38		22	52	27½	18	55	28½	36		2	1¼
2	425	39	1¼	8	6	5½	2½	44		26	60	32½	21	62	30½	42		2½	1½
2	625	48	1¼	12	6	5½	2½	52		30	68	37	25	72	33½	49		3	2

BIBLIOGRAPHIES ON HEATING AND VENTILATION

A general bibliography on heating, lighting and ventilation has been prepared by the Hospital Library and Service Bureau of the American Conference on Hospital Service, Chicago, Ill. The portion on heating and ventilation is presented herewith:

Heating and Ventilating—General.

Back to first principles; elementary course in heating and ventilating engineering. R. Davies, diags. Heat & Vent. 18:34–8, April; 38–41, May 1921.

Colec system of central and radiant heating. H. W. Berry. Electrician 86:419–20, April 8, 1921.

Fan and heater arrangements for public buildings. C. L. Hubbard. diags. Dom. Eng. 94:5–7, Jan. 1, 1921.

Fire hazards connected with heating and ventilating work. I. H. Woolson. Am. Soc. Heat. & V.E.J. 27:286–92, April, 1921.

Heating and ventilating equipment. C. L. Hubbard. il. diags. Am. Arch. 119:367-72, Mar. 23, 1921.

Heating and ventilation. C. L. Hubbard. 213p. American technical society, Chicago, 1921.

Heating government houses in a hurry; how return-air furnace equipment was installed. il. plans Sheet Metal Worker 11:449–52, Jan. 7, 1921; discussion, 12: 109–10, Mar. 18, 1921.

Heating guidance for residence work. il. diags. plan Metal Work 94:97–100, 174–6, 277–9, July 23, Aug. 6, 27 '20; (cont. in) Plumber 95:598-600, Dec. 31, 1920.

Heating, past and present. A. G. King. Dom. Eng. 94:136–8, Jan. 15, 1921.

Heating the small house. W. R. Eaton, il. Bldg. Ag. 43:55–8, April; 46–7, May, 1921.

How modern England heats her homes, il. plan Plumber 95:61–2, Feb. 11, 1921.

John R. Allen's last pronouncements on heating and ventilation. Heat. & Vent. 18:29–30, Jan., 1921.

Supplementary or secondary heaters. C. L. Hubbard. diags. plans Dom. Eng. 95:208–9, April 30, 1921.

Using fans in warm-air furnace heating, diags. Sheet Metal Worker 12:264, May 27, 1921.

Warm in winter—cool in summer; system of heating and ventilating which keeps a Florida climate in an Ohio home the year round. il. Plumber 94:583–4, Dec. 31, 1920.

Warming buildings with refrigerating equipment. R. Matthews, diags. Power 53:628–31, April 19, 1921.

STUDY AND TEACHING.

How heating and ventilation is taught at Purdue University. R. W. Noland. diags. plans Heat. & Vent. 18:25–6, May, 1921.

Technical requirements in the heating profession. J. D. Hoffman. Dom. Eng. 95:213–14, April 30, 1921.

Technical school training for the heating profession. J. D. Hoffman. Heat. & Vent. 17:37–9, July, 1920; Same. Metal Work 94–365–7, Sept. 17, 1920.

TABLES, CALCULATIONS, ETC.

Air as a conveyor of heat. S. H. Woodbridge. Heat. & Vent. 18:29–31, May, 1921.

Details of a $3500 furnace heating system. il. plans Sheet Metal Worker 12: 217–19, April 29, 1921.

Heat loss tables; Jones tables. Heat. & Vent. 18:62–5, April; 62–5, May, 1921.

Installing heaters to please and to pay. ill plans Plumber 95:29-30, Jan. 28, 1921.

Key for computing boiler sizes for direct radiation. Dom. Eng. 94:76–7, Jan. 8, 1921. Same, Heat. & Vent. 18:48–9, Feb. 1921.

Pound of steam. L. M. Emmett. Dom. Eng. 93:614–15, Dec. 25, 1920.

Standards for computing radiation and boiler sizes. Dom. Eng. 93:605, Dec. 25, 1920.

System of piping for hot water jobs. C. L. Hubbard. diags. Plumber 95: 305–7, May 20, 1921. (to be cont.)

Testing and adjusting heating systems. C. L. Hubbard. Dom. Eng. 95:57–8, 115–16, April 9–16, 1921.

Transmission of heat through single-frame double windows. A. W. Shaw. il. Am. Soc. Heat. & V. E. J. 26:773–86, Dec., 1920.

TESTING.

Report of committee on standard code for testing heating systems. Am. Soc. Heat. & V. E. J. 27:38–42, Jan., 1921; Discussion. 27:163–4, Mar., 1921.

Pages 196–197, Industrial Arts Index, June, 1921.

VENTILATION.

Flue arrangement for gravity heating. C. L. Hubbard. diags. Dom. Eng. 93: 503–5, Dec. 11, 1920.

Heating and Ventilating equipment. C. L. Hubbard, (illus. diags.) Am. Arch. 119: 367–72, 399–405, Mar. 23–30, 1921.

John R. Allen's last pronouncement on heating and ventilation. Heat. & Vent. 18:29–30, Jan., 1921.

Plea for better air distribution in ventilating systems. J. R. McColl. Am. Soc. Heat. & V. E. J. 27:417–19, May, 1921.

Speaking of ventilation. Sci. Am. 124:172, Feb. 26, 1921.

Studies in theory—outside versus inside air. diags. Sheet Metal Worker, 12:145–6, April 1, 1921.

Study of the infiltration of air in buildings. O. W. Armspach. il. diags. Am. Soc. Heat. & V. E. J. 27:43–53, Jan., 1921.

Ventilating scheme that worked; 1-in. fan used to draw the foul air out of underground toilet room. diags. Sheet Metal Worker 12:73, Mar. 4, 1921.

Ventilation handbook. C. L. Hubbard, 2d. ed. rev. and enl. 231p. Sheet Metal Pub. Co., New York 1920.

Ventilation made to order. Sci. Am. 123: 636, Dec. 25, 1920.

Ventilation of the home office building of the Travelers' Insurance Company, Hartford, Conn., il Am. Arch. 119:459–62, April 13 1921.

Ventilation of the machine room with the Briner economizer. W. H. Howell, Jr. Paper 28:32–3, May 18, 1921.

Page 404—Industrial Arts Index, June, 1921.

Magazine References on Heating, Lighting and Ventilation of Hospitals.

A separate bibliography has been prepared by the bureau on heating, lighting and ventilation as applied especially to hospitals, sanatoriums and allied institutions. This was compiled largely through the efforts of O. E. Norman, of the People's Gas, Light & Coke Company, of Chicago. The portions covering heating and ventilation are as follows:

Magazine References on Heating and Ventilating—Hospitals.

Allen, J. R. Heating and ventilating of institutional homes, especial application to homes for convalescents, aged and children. Nations' Health. 3:475–476, Aug., 1921.

Allen, J. R. Operation of ventilating plant important. (Chart) Hosp. Mang. 8:32–33, Oct., 1919.

Allen, J. R. Air space for children. (Round Table) Hosp. Mang. 8:54, Aug. 1919.

Armspach, O. W. Humidity. Rel. Wet Bulb Temp. to health. Journ. Am. Soc. Heat. & Vent. Engrs. 26:4, 480–88, May, 1920.

Baum, A. L. Efficient heating for institutional groups. Mod. Hosp. 7:217–219, Sept., 1916.

Shew, F. K. Humidity. Doctors say homes are too hot and dry. Jour. Am. Soc. Heat. Engrs. Vol. 25 No. 2, 20–25, April, 1919.

Cutting coal wastes. (Round Table) Hosp. Mang. 11:53, July, 1921.

Dryden, H. L., Stutz, W. F., & Heal, R. H. Ventilators. Some comparative tests of 16" Roof Ventilators. Jour. Am. Soc. Heat. & Vent. Engrs. vol. 27, No. 2, 93–100, March, 1921.

Eddy, C. A. Mechanical control of air conditioning. Hosp. Mang. 9:44–45, Jan., 1920.

Feldman, A. M. Cooling. Method of utilizing heating systems for cooling rooms in summer. Jour. Am. Soc. Heat. & Vent. Engrs. vol. 27, No. 1, pages 15–18, Jan. 1921.

Figuring the cost of coal. (Round Table) Hosp. Mang. 2:10, Aug., 1916.

Fuel oil economical. (Round Table) Hosp. Mang. 10:53, Sept., 1920.

Heating and ventilation. Govt. Publication on requirements and standards for H. & V. Heat. & Vent. vol. 16, pages 17–21, Jan., 1919.

Hill & Aeberly. Humidity. Relation of death rate to set bulb temp. Jour. Am. Soc. Heat. & Vent. Engrs. vol. 26 No. 4, pages 471–480, May, 1920.

Hubbard, C. L. Heating and ventilating a cottage hospital. (Plans) Dom. Eng. 92:108–12, 167–9, 221–3, 377–9, 485–8, 589–91; 93:68–9, July 17–31, Aug. 21, Sept. 4, 18; Oct. 9, 1920.

Huntington, E. Humidity and Temp. Study of effects of Temp. & Humid. upon death rate. Am. Soc. Heat. & Vent. Engrs. vol. 25, No. 3, 23–24, July, 1919.

Huntington, E. Purpose and methods of air control in hospitals. Mod. Hosp. 14:271–275, April; (Pt. 1.) 348–353, May, 1920 (Pt. 2.).

Kimball, D. D. Relation of the architect and engineer. (Reprint from Heating and Ventilating Magazine for March and April, 1915.)

Kitchen ventilation. Mod. Hosp. 3:218, Sept., 1915.

Knowles, E. R. Principles of daylight and artificial lighting of hospitals. Mod. Hosp. 7:22–28, July, 1916.

Lyon, E. P. Humidity. Physiological Heat. Regul. & Prob. of Humidity. Jour. Am. Soc. Heat. & Vent. 26: 677–87, Nov., 1920.

Meier, Konrad. Hospital ventilation. Mod. Hosp. 15:272–275, Oct.; 358–362, Nov., 1920.

Nichols, G. B. Heating and lighting, standardized H. & L. plans for State Institute. Heat. & Vent. 17:32–41, Jan., 1920.

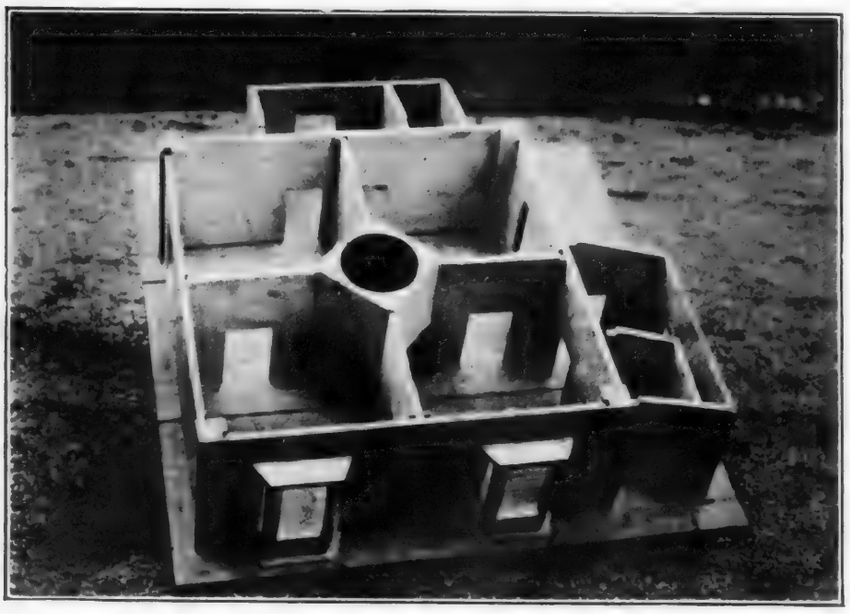
Nichols, G. B. Standardized central heating and lighting plants for state institutions. (Illus. diags. plans.) Heat. & Vent. 17:32–41, Jan., 1920.
Ozone in ventilation. Public Health Report. April 23, 1920. (Abstract).
Partitioning the wards. (Round Table) Hosp. Mang. 10:47, Aug., 1920.
Practical methods of saving coal in hospitals. Hosp. Mang. 5:22–23, Feb., 1918.
Sutton, Frank. Heating systems for hospitals of various sizes. Mod. Hosp. 6: 402–404, June, 1916.
Sutton, Frank. Is mechanical ventilation in hospitals a success? Mod. Hosp. 6: 317–319, May, 1916.
Sutton, Frank. Should the hospital buy power or install a plant? Mod. Hosp. 7:31–32, July, 1916.
Ventilation—location of toilets. (Queries and Answers.) Mod. Hosp. 6:231, Mar., 1916.
Ventilation, mechanical, in hospitals. (Queries and Answers.) Mod. Hosp. 6:231, Mar., 1916.
Walker, S. F. Heating and ventilating British Hospitals. Mod. Hosp. 6:49–54, Jan., 1916.
Watt, W. E. Proper ventilation proves economy. Hosp. Mang. 10:47–48, Dec., 1920.
Whitacre, R. B. Insuring efficiency of mechanical equipment. Hosp. Mang. 6: 22–23, 44, Nov., 1918.

BOOKS.

Glaister, John. Methods of ventilation applied to rooms, large buildings, and hospital wards. (Illus.) (in his Manual of hygiene for students. p. 44–64.).
Glaister, John. Sick room temperatures. (Illus.) (in his manual of hygiene for students p. 87–92.)
Stevens, E. F. Heating, ventilating and plumbing. (in his Amer. Hosp. of the 20th century. 1921. p. 312–326, 106–109, 334.)

English Engineer Devises Central Fireplace for Houses.

An English engineer, F. H. Martyn, has devised a central rotating fireplace which enables a householder literally to "carry his heat" from room to room of an ordinary four-room dwelling, such as is illustrated in the model shown herewith. Fireplaces are constructed in each of the four rooms while the fire, built on a revolving plate, may be turned by means of a handle from one room to another, as may be desired. An added contrivance provides for the heating of the water in the same operation.



PROPOSED CENTRAL ROTATING FIREPLACE FOR HOUSES.

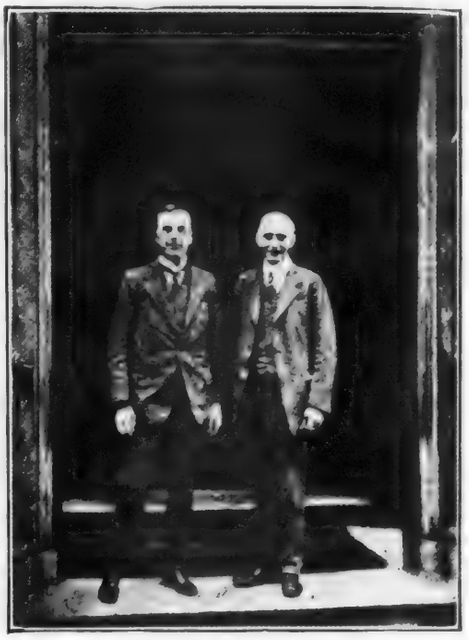
Warm-Air Furnace Code Ordered Distributed.

Although lacking the approval of the American Society of Heating and Ventilating Engineers, the new standard code for regulating the installation of warm-air furnaces in residences, as adopted by the National Warm Air Heating and Ventilating Association, the National Association of Sheet Metal Contractors and the Western Warm Air Furnace and Supply Association has been ordered printed in the names of the three organizations endorsing it. The title page will omit the names of the committeemen and all reference to the American Society of Heating and Ventilating Engineers.

In the meantime Professor James D. Hoffman, chairman of the general committee which drew up the code, has been prevailed upon to retain the chairmanship of the Committee on Furnace Heating of the American Society of Heating and Ventilating Engineers, at least until the next annual meeting. He is now at work on a revision of the code which he will present to the heating engineers' society as a minority report of the joint committee.

President McColl in England.

The first meeting of a president of the American Society of Heating and Ventilating Engineers with a president of the (British) Institution of Heating and Ventilating Engineers occurred recently in London when President Jay R. McColl of the American society was the guest of President A. H. Barker of the British society. Mr. McColl went abroad shortly after the midsummer meeting of the



PRESIDENT A. H. BARKER OF THE (BRITISH) INSTITUTION OF HEATING AND VENTILATING ENGINEERS AND PRESIDENT J. R. McCOLL OF THE AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS AT THE JUNIOR ATHENAEUM CLUB, LONDON.

heating engineers' society to meet his wife and daughter, who had been touring the Continent. During his stay in London he visited the offices of the British Institution of Heating and Ventilating Engineers. His coming was quite unhearalded and was very much of a surprise.

As reported in the British society's organ, Mr. Barker, on short notice, got in touch with one or two members and the party, including President McColl, President Barker, J. L. Musgrave, W. W. Nobbs, and Secretary W. G. Hollinworth of the British institution, met for luncheon at the Junior Athenaeum Club. Afterwards W. W. Nobbs accompanied President McColl to University College and showed him the Research Laboratories there. Later Mr. McColl and family were entertained at dinner and afterwards paid a visit to the National Theatre, Drury Lane, where they saw the performance of "Decameron Nights."

"Own Your Home" To Be Presented in Motion Pictures.

A five-reel film, showing the erection, equipping and furnishing of a modern six-room, brick Colonial home will be produced by the Atlas Educational Film Company, of Oak Park, Ill., to give national scope to the "Own Your Home" and "Home Electrical" movements. A lot in Glen Ellyn, Ill., has been chosen as the site for this model home. It will be fully equipped with every modern device—electrical and otherwise. A number of phases, such as the investment problem, selection of

the lot, the contractor, the architect, choice of materials and furnishing the home, are prominently featured.

Bookings for this film are now being made. In the case of real estate clubs, rotary clubs and similar organizations, it is stated, only a nominal charge is made to cover the renovating and circulation of the film.

NATIONAL TRADE EXTENSION BUREAU

Launching of National Apprenticeship Campaign.

The shortage of skilled workmen in the heating and plumbing industries has led the National Trade Extension Bureau to inaugurate a campaign to interest American boys and their parents in the opportunities in these fields. A form of poster, for instance, has been prepared entitled "Wanted, Real Boys" which employers are asked to post in their windows.

In addition the bureau has compiled a booklet under the title of "A Business Future for American Boys," which extols the advantages of the heating and plumbing trades. "We believe," declares the booklet, "that there are no trades, occupations or professions offering more advantages than plumbing and heating for the average boy of mechanical inclination. They offer more money in ten-year period or life expectancy than the majority of trades or occupations. After a four-year training or apprenticeship, plumbing or heating will give the boy a highly-profitable trade; an interesting and constructive work, with plenty of diversity, offering unlimited possibilities for mechanical and commercial ability. And unlike old-time apprenticeships, the heating and plumbing trades will pay a boy a good wage while he is learning and make him worth even more in the long run than he can secure at some temporary highly-paid job."

HOW THE BUILDING TRADES COMPARE WITH OTHER OCCUPATIONS.

The average life expectancy in money of the higher skilled and highly paid mechanics in the building trades, points out the booklet, amounts to about $65,000. This estimate is based on the law of averages and considers the fact of the occupation being seasonal and therefore irregular. This seasonal time loss has been one of the most common objections to a boy's learning any of the building trades. Plumbing has one of the lowest seasonal time losses of all the building trades; heating or steam fitting has a slightly higher time loss.

The life expectancy of the truck or express driver, the dry goods clerk, the bookkeeper, and occupations paying wages, continues the booklet, amounts to about $50,000 for his lifetime. In the plumbing trade, even allowing the seasonal loss of 73 days a year, using a year of only 208 working days, the life expectancy earnings of a boy are $77,376. This figure is based on the present average wage of approximately $1.00 per hour.

It is further pointed out that the heating and plumbing trades do not constitute "blind alleys," offering no chance for advancement. Many of the present salesmen, superintendents, the majority of master plumbers and heating contractors, and some of the largest manufacturers in these industries, commenced their business careers as apprentices in the heating and plumbing trades.

The opportunities for service are mentioned as an added inducement, the booklet concluding with a picture of the future possibilities of these industries. The plumbing and heating industries, it is stated, are just awakening to their business possibilities. They have a potential market unequalled in any known industry today. Here are a few of the facts:

Of the 22,500,000 homes in the United States, approximately 19,500,000 are without efficient heating equipment and 17,500,000 are without adequate plumbing facilities. Only 680,000 of our 6,500,000 farm homes are equipped with plumbing. As the booklet states, both the heating and plumbing industries are comparatively young. The figures given show that they have a wonderful opportunity for future development. The last ten years has seen an immense increase in population, a more general understanding of the importance of heating, ventilating and sanitation, national advertising of the products of these industries and the adoption of a more aggressive and enlightened sales policy by manufacturers, jobbers and dealers.

There has never been such rapid development in these industries as during recent years and the prospects for the future are still brighter. There is need for a great number of skilled workmen who will enter ino and develop with this industry. Even now the number of these efficient skilled workmen is insufficient to supply the demand.

Further details of the bureau's apprenticeship campaign are available from the Apprenticeship Department, National Trade Extension Bureau, Evansville, Ind. R. E. Maloney is in direct charge of the movement.

GOOD HEALTH WEEK, OCTOBER 23-30, 1922

Stage Set for Good Health Week Campaign

If the co-operation of the different States and municipalities, together with that of newspapers, magazine, trade journals and other mediums of publicity, such as women's clubs and school officials, means anything, the public throughout the country will learn much about ventilation, sanitation and personal hygiene, during the forthcoming Good Health Week, October 23-30.

As has been pointed out by the Good Health Week Promotion Bureau, of which G. C. Breidert, sales promotion and advertising manager for the Ilg Electric Ventilating Company is chairman, all manufacturers who have a product or organizations that furnish a service which can legitimately qualify as an aid to good health under the three general subjects of ventilation, sanitation and personal hygiene are, at the discretion of the executive committee, eligible to promote Good Health Week. It is not desired to conduct an educational campaign on the cure of any evil, but to teach the public preventive measures relative to good health which, if only partially carried out, will greatly facilitate the efforts of national, State and city authorities to lessen sickness and reduce death rates.

Every health department, whether city, State or national, finds it difficult, through lack of advertising facilities, to keep the public informed on important measures. By connecting Good Health Week with the millions of dollars of advertising money appropriated yearly by such industries as have products to sell or services to render that will benefit health, educational matter of a valuable and interesting character may be passed on to the public and at an insignificant cost.

All firms interested in the movement who are in a way to be benefited through the campaign are urged, if they have not already done so, to procure Good Health Week stickers for use on their stationery. For every $2.50 subscribed 1000 seals will be furnished the subscriber. Additional seals may be purchased at 50 cents per 1000 by subscribers and $1.00 per 1000 by non-subscribers.

Every industry has some local connection throughout the United States and these are urged to aid in locally organizing the Good Health Week program. This program may include lectures before such clubs as the Rotary, Kiwanis and Civic and before Chambers of Commerce. If possible lectures should also be arranged in churches, schools, lodges and colleges. Every industry likewise has local representatives who can, through the co-operation of local health authorities, physicians and public-spirited citizens, do their part toward carrying out the Good Health Week program.

Full details as to any feature of the campaign, together with suggestions for good health articles and lectures on ventilation, sanitation and personal hygiene, suitable for publication as editorials in local newspapers, may be procured by addressing Good Health Week Promotion Bureau, Room 704, 209 Grand Avenue, Milwaukee, Wis.

New Apparatus and Appliances

A Metering Radiator Bushing.

A radiator bushing which meters or measures the steam which passes through it, has been designed by A. B. Holly, 300 First National Bank, Virginia, Minn.; its construction is shown in the accompanying illustrations. Besides metering the steam, it also acts to guide the steam in a certain predetermined direction.

The metering is done by providing the bushing with a hole of correct size which, under the working conditions of the heating plant, is designed to allow just enough steam to enter the radiator to meet the exposure needs which this radiator is caring for. The amount of the radiator which is heated is determined by the steam pressure supplied. This pressure is regulated to suit the weather needs, and it is stated, permits the correct amount of heat to be supplied to every part of the building under all weather conditions.

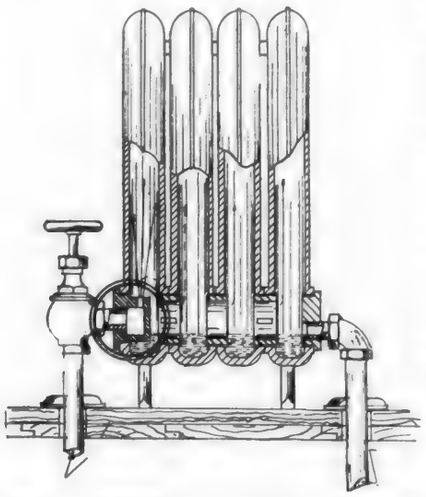


FIG. 1.—METERING RADIATOR BUSHING APPLIED TO RADIATOR.

By controlling the direction of flow, the steam may be guided into that part of the radiator which will insure complete filling of each section of the radiator.

Fig. 1 shows the bushing as applied to a steam-type radiator. The steam is directed to the top of the first section crowding out all of the air. When the first section is filled, the steam, having lost its velocity of flow against the column of steam passes slowly through the upper part of the connection to the next section of the radiator. Each section in order is fully filled before any heat is evident in the next section. This action assures the removal of all of the air and a maximum heating value from the entire radiator.

The same type of bushing is also used in the lower opening of a water-type radiator. After rising to the top of the first section in this type of radiator the steam passes along the top in the same manner as though the regular steam connection had been made at the top of the radiator. This use of the bushing is of service for converting hot water plants into vapor steam systems. It is not necessary to make any changes in the radiator connections except to replace the old bushing with the metering bushing. Even the hot water valve can be used in many instances.

The Type "B" metering bushing which is not illustrated, is designed for the upper connection of water-type radiation. It is used on new work, where the advantages of orifice regulation with its consequent economies are desired.

When this bushing is used the temperature of the condensate has been found to be surprisingly low, even when steam-type radiation is used to its full capacity. In a recently-conducted test on an 8-section, 3-col., 38-in. steam-type radiator, with just enough steam pressure to allow seven sections of the radiator to be heated, after a continuous run of 15 hours the condensate had a temperature of 122° F. just as it left the radiator. This temperature is so close to that which would be attained under similar conditions with hot water-type radiation that an owner would not be justified in discarding the old radiation when connecting up with central station system using vapor or atmospheric heating.

In addition to its value in saving old steam radiation and saving in the cost of converting water heating plants, the metering bushing offers another advantage to the steam user. If the entire building is equipped with these bushings the heat can be properly regulated in all parts of the building by varying the steam pressure to meet the weather conditions. This prevents the needless waste of heat by some tenants, who, when the regulation of temperature is left to them, will do all the regulating by opening windows, leaving steam valves wide open. Where buildings are rented heated this becomes an important matter.

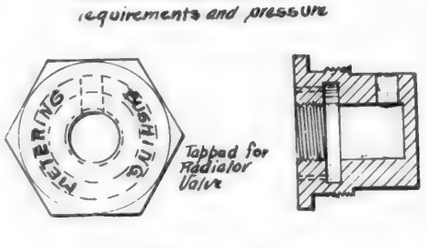
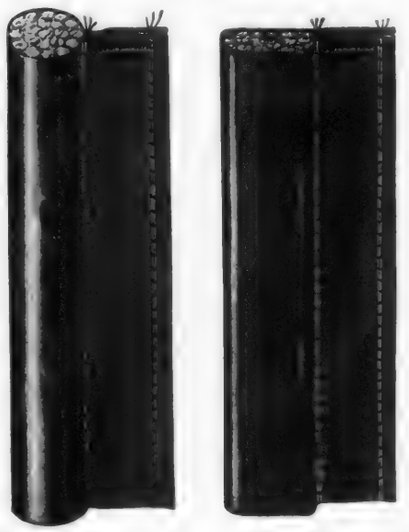

Opening for steam flow. Size determined by requirements and pressure
METERING
Tapped for Radiator Valve
Pipe size to fit Radiator.

FIG. 2.—DETAIL OF METERING RADIATOR BUSHING.

Many readers of THE HEATING AND VENTILATING MAGAZINE will recall several very interesting articles in 1920-1921 by Prof. S. Homer Woodbridge on the "Value of the Orifice in Steam and Water Heating." In these articles this question was very thoroughly discussed and the simplicity of the orifice for this work was very clearly brought out. These articles, together with the local need of saving large installations of old steam radiation when contracting for central station vapor steam, are responsible for the development of this bushing.

New Type of Weather-Proof Cushion Gasket.

A form of weather-stripping which has been put out by E. J. Wirfs, 17th and Walnut Streets, St. Louis, Mo., and which is described as Wirfs' compressible waterproof cushion gasket, has a number of features of interest to heating men. It was designed for use in connection with refrigerating work but has been found to be equally useful for stopping cold air leaks in windows and doors. The gasket is described as woodless, metal-less, rustless, flexible and adjustable to wavy surfaces or alignments, with a resilient or cushion effect.



Natural Shape. When Compressed.

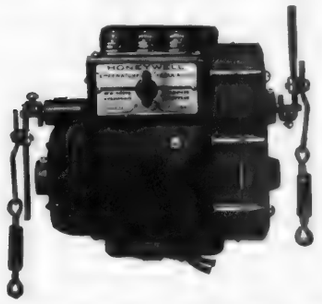
NEW FORM OF WATERPROOF WEATHER STRIPPING.

No sawing or mitering of corners is necessary as the gasket is tacked on and turned at the corners. This product is made in three sizes, any length, and is regularly furnished with brown rubberized casing.

New Electric Motor for Use with Temperature Regulators.

A new repulsion-type electric motor for temperature regulator use has been placed on the market by the Honeywell Heating Specialties Co., Wabash, Ind. The motor and transformer are integral, the device being a self-contained unit housed in a solid cast frame, instead of being two devices assembled into a single unit. The motor is described as oil and dust-proof and protected against fine dust and smoke. It contains a type of brush holder heretofore used only on special motors and one to which oil cannot stick. Frequent oiling is found to be unnecessary. Oil leads which open under pressure carry the oil to felted inserts in the bearing housings.

The fields and armatures are of unqiue assembly in order to develop the step-down from 110 volts, A. C., to the low voltage delivered at the three thermostat cable terminals. Energy is transmitted from the motor to a train of "figure eight" gears, designed to develop more power than would ordinarily be required for temperature-control service. The lifting power of the motor, one inch from the crankshaft, is given as 100 lbs. The motor is connected in the usual way to alternating current house-lighting circuits, the same motor with modifications being furnished for direct current circuits. The



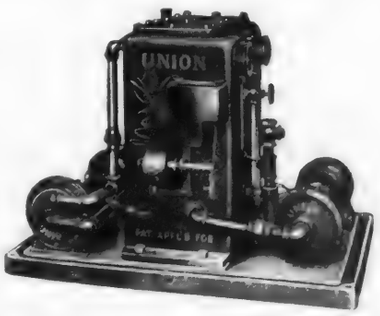
NEW HONEYWELL ELECTRIC MOTOR FOR USE WITH TEMPERATURE REGULATOR.

device, it is stated, was developed by engineers in the company's factory and in the laboratories of the General Electric Company.

In addition to filling the demand in the regular field, it is described as particularly suitable for central station heat control, steam or hot water, oil-burning or special applications, as the speed of the crank shaft can easily be varied from four seconds to two minutes for each half revolution.

The New Union Centrifugal Vacuum and Boiler-Feed Set.

When a manufacturer of the prominence and reputation of the Union Steam Pump Co., of Battle Creek, Mich., announces a new development in connection with its extensive line of pumps for heating and other work, it is safe to say that the new product has features which are likely to interest all users of these outfits. This expectation is fully met in the company's latest product which has just been



NEW UNION CENTRIFUGAL VACUUM AND BOILER-FEED SET.

placed on the market under the name of the Union centrifugal vacuum and boiler-feed set. For years the company has furnished a regular steam-driven vacuum pump and also manufactures electric-driven pumps. The limitations of a gear-driven vacuum pump of the reciprocating type, however, are well known, especially if it has to be located within the building.

The demand now is for a small centrifugal type of vacuum pump, suitable for handling both air and water and of such a type that it can be direct-connected to electric motors to avoid noise. The fact that the company was already producing standard lines of pumps for practically every purpose was a fortunate circumstance, as it enabled its engineers to arrange a combination from these standard lines. As a result the company now offers an outfit consisting of the accumulating and separating tank, arranged with two of its centrifugal pumps, standard in every way. One of these pumps is intended to return the accumulated condensation to the boiler, normally under 10 lbs. pressure, but not limited to this as the company is prepared to furnish any of its standard types of centrifugal boiler-feed pumps upon any required boiler pressure. The vacuum pump which goes with the outfit, is described as a standard centrifugal type and is made in any capacity to suit conditions.

The entire outfit, consisting of two independent pumps, each under its own automatic control and a cast-iron separating tank mounted on a common subbase, makes it necessary only for the contractor to connect the separating tank to the return line of the vacuum system, and the discharge from the boiler-feed pump to the boiler-feed line.

The Union centrifugal vacuum and boiler-feed set is furnished in a series of four sets or combinations to cover general requirements. Size No. 1, for instance, has a rated capacity of from 8000 to 16000 sq. ft. of direct radiation, while Size No. 4, which is the largest, has a rated capacity of from 40,000 to 65,000 sq. ft. The rated capacities of the two intermediate sizes are from 16,000 to 26,000 sq ft. and from 26,000 to 40,000 sq. ft. respectively. This series, together with the varied lines of pumps manufactured by the company, makes it possible for the company to give a wide range of service in the way of pumping equipment for either vacuum or pressure work.

Under the title of the "Union Engineering Handbook" the company publishes a manual for architects and engineers which is replete with practical data on pumps.

New Publications.

A Brief Review of the By-Product Coke Industry is the title of a timely pamphlet published by the Seaboard By-Product Coke Co., Jersey City, N. J., manufacturer of Koppers Seaboard coke. The pamphlet points out that there are three methods of coke manufacture: gas house, beehive and by-product. Gas house coke, it is stated, is made in small retorts from soft coal very high in volatile matter. The gas obtained is of first importance and the resultant coke is often light, soft, somewhat spongy and quite friable. The beehive type of oven, continues the pamphlet, was first used to manufacture metallurgical coke. Into this oven coal was charged at the top and allowed to smoulder for from 48 to 72 hours. The gases, in the meantime, escaped through a vent in the top and were dissipated in the open air.

The modern by-product oven, it is stated, was developed in Europe. In 1906 the United States Steel Corporation sent a committee of its engineers abroad to investigate the types of by-product ovens then available. As a result, the first Koppers ovens were built in Joliet, Ill., in 1908. At the close of the war in 1918, it is added, three-quarters of the entire by-product coke produced in the United States was made in this type of oven.

The circular concludes with the figures of a test made at Yale University in 1920 on Koppers Seaboard coke in two H. B. Smith Company low-pressure boilers. These tests showed efficiencies higher than those obtained with anthracite or bituminous coal, running as high at 85%. At the same time, the report states, it was brought out that coke can be burned as efficiently as coal in existing boilers. In these tests the comparative efficiency of anthracite coal, semi-bituminous coal and by-product coke fired in a No. 27 Smith boiler, at three-fourths rated capacity, and long firing periods was as follows:

	Overall Efficiency
Anthracite pea	72%
Semi-bituminous	74%
By-product coke	77%

The pamphlet also quotes the results obtained by the Bureau of Mines in its tests at the Engineering Experiment Station of the University of Illinois in which efficiencies of boiler and furnace were obtained as follows: By-product coke 61.63%, gas-house coke 56.22%, anthracite, 51.93%, Illinois Coal (Williamson County) 48%. Pocahontas coal 46.51%. In the same tests the rated capacities developed were: With by-product coke 64.46%, with gas-house coke 65.48%, with anthracite 66%, with Illinois coal (Williamson County) 64.04% and with Pocahontas coal 63.88%.

A Zoning Primer, devoted to the zoning of buildings in American cities, has been published by the Advisory Committee on Zoning appointed by Secretary Hoover of the Department of Commerce. Zoning itself is described as the application of common sense and fairness to the public regulations governing the use of private real estate. In answer to the question as to why we need zoning, the circular calls attention to the way we allow stores to crowd in at random among private dwellings and factories and public garages to come elbowing in among neat retail stores or well-kept apartment houses. Cities do no better, it is argued, when they allow office buildings so tall and bulky and so closely crowded that the lower floors not only become too dark and unsatisfactory for human use, but for that very reason fail to earn a fair cash return to the individual investors. Zoning, however, it is added, should go hand in hand with planning streets and providing for parks and playgrounds. The booklet contains suggestions as to how to

start a zoning movement in any given locality, together with a zoning program covering such points as surveys, technical advice, scope of a zoning ordinance, getting public support and zoning in operation. The bulletin concludes with information on what cities and towns have already accomplished by zoning. Further information on the subject, it is stated, may be obtained from the Division of Building and Housing of the Department of Commerce, Washington, D. C. Size 5½ x 9 in. Pp. 8.

Trade Literature.

AIR CONDITIONING, including cooling, drying, humidifying, dehumidifying and air washing, is discussed in a number of reprints of papers and in bulletins which are listed in a special circular sent out by the Atmospheric Conditioning Corporation, Lafayette Building, Philadelphia. Among the reprints listed are S. C. Bloom's "Brine Spray Refrigeration," M. G. Harbula's "Summer Sausage Drying," and S. R. Lewis's "Ventilation of Large Packing House Office Building."

UTICA-IMPERIAL SUPER-SMOKELESS BOILER bulletins, which, as announced in last month's issue, are being published in serial form comprising seven bulletins, now include the Theatre Building Bulletin, and the Public Building Bulletin. Those previously published were the School Bulletin and the bulletin on apartments, hotels and residences. In the theatre building bulletin the typical buildings shown, in which Utica-Imperial super-smokeless boilers are installed, include the Brighton Theatre, Chicago; Elmwood Theatre, Buffalo; Capitol Theatre, Cincinnati; Cameron Theatre, Denver; Lincoln Theatre, Washington, D. C.; Roosevelt Theatre, Chicago; and Iowa Theatre and Office Building, Des Moines. The public building bulletin is equally impressive, the illustrations of Utica-Imperial equipped buildings including the Montgomery County Jail, Norristown, Pa.; Savings Trust Co., St. Louis; Mitchell Park Conservatory, Milwaukee; Noel State Bank, Chicago; Mexican Embassy, Washington, D. C.; Masonic Temple, Racine, Wis.; Illinois Central Railroad Station, Chicago; Pittsburgh Hospital, Pittsburgh; and City Isolation Hospital, Racine, Wis. The fact that these boilers are designed to operate with soft coal makes them especially interesting in the present coal situation. Size of each bulletin, 8½ x 11 in. Pp. 12 each.

VALVE WORLD for September, 1922, published by Crane Co., Chicago, Ill., continues the interesting series of articles it has been running on "Accidents That Have Made Men Famous." The September article is devoted to William Lee and the stocking loom. This number contains the announcement that on September 1 the name of Crane & Ordway Company, St. Paul, Minn., was changed to Crane Company of Minnesota. The change, it is stated, is in name only and does not affect the personnel, management or ownership of the company. At the time of the change in name the company operated through nine branches and warehouses as a part of the Crane organization. Within the next few months, it is added, Crane Company of Minnesota, continuing the Crane & Ordway Company, will move into new and larger quarters at Fourth Street and Broadway, St. Paul.

SIROCCO SERVICE for September, 1922, the monthly periodical of the American Blower Co., Detroit, Mich., has interesting articles on bread-making; wood-curing in furniture manufacure; and brick manufacture, in all of which the company's Sirocco fans and air conditioning equipment are installed. Some typical St. Louis school buildings, designed by W. B. Ittner, are presented in connection with an article dealing with the general features of their design. Other articles in this number are "Removing the Moisture from Sugar," featuring the use of a Sirocco Ventura fan in connection with a dryer of ingenious construction, and an article on "Conveying Cork by Air."

RELAYS, THEIR OPERATION AND GENERAL APPLICATION, are the subject of a new bulletin (No. 47606) published by the General Electric Company, Schenectady, N. Y. The table of application of standard relays in the back of the bulletin will assist in giving a general idea of the different types and applications of the more common relays. The publication of the bulletin, it is stated, is the result of the increasing tendency towards more intricate networks and the rapidly-increasing practice of interconnecting existing systems. Size 8 x 10½ in. Pp. 28, punched for binding.

SPRAGUE ELECTRIC TYPE WX HOISTS, worm drive, described as a remarkably simple and practical hoist for miscellaneous uses, is the subject of a bulletin issued by the Sprague Electric Works of General Electric Co., 527 West 34th Street, New York. The hoist has a capacity of 1½ tons, while its speed is 25 ft. per minute, and its lift 20 ft. It is furnished for either A. C. or D. C. Size 8 x 10½ in. Pp. 4.

WEATHER VEIN for September, 1922, published by the Carrier Engineering Corporation, Newark, N. J., contains, among other things, a breezy indictment of radiators and warm-air furnaces on the three counts of temperature, relative humidity and velocity. In this article it is maintained that neither radiators or warm-air furnaces can accomplish even the first of these counts (temperature) with any degree of uniformity. In a room heated by radiators, runs the argument, the temperature nearest the radiator is too high and farthest therefrom too low. The temperature near the ceiling in such a room is usually from 10° to 20° higher than at the floor. A human being, it is argued, exposed to such a condition is like the chameleon who died in his efforts to adjust himself to a Scotch plaid. On Count Two (relative humidity), continues the arraignment, the radiator must plead guilty without extenuating circumstances, being utterly unable to humidify the air. On Count Three (velocity) the radiator, it is claimed, has but a weak and uncertain case. Any difference in temperature between two columns of air will cause the cooler to move towards the warmer in an effort to equalize the temperature difference. Thus the air near a radiator and, it is added, the dust and dirt, ascends, the cooler air near the floor flowing into replace it, being heated in turn and ascending in turn. Thus a convection circulation is established and it is by this means, principally, that the radiator heats the room. But convection circulation, it is argued, even under the most carefully-designed conditions, is uncertain, non-uniform and slow.

FUEL-OIL FACTS, devoted to the advantages of fuel-oil burning and showing views of representative installations, buildings in which service is installed, letters of endorsement and complete information for prospective users, is the title of a notable catalogue published by the Petroleum Heat & Power Co., 511 Fifth Avenue, New York. This company, which had its origin as the Fess Rotary Oil Burner, Inc., on the Pacific Coast, established its business in the East several years ago. In addition to its fuel-oil burning equipment factory in Stamford, Conn., and oil delivery and installation facilities in the Boston, Providence and New York territory, the company has recently established, through its subsidiary, the East Coast Fuel Oil Company, Inc., a 7-acre storage plant on Newtown Creek, just across the East River. It is pointed out in the catalogue that the company makes two distinct types of burners, the steam atomizer burner for high-pressure and the turbine burner for low pressure plants. The company also manufactures the accessory equipment to complete the installation of either of these types, this equipment including heaters to heat the oil to a proper temperature for atomizing, strainers, regulators for automatic control of oil and air supply in correct proportions, damper regulators, anti-siphoning apparatus, pumps, and fan sets for supplying the air. Special attention is directed in the catalogue to the company's automatic regulation methods, which includes four types of regulators. On the subject of the dependability of the oil supply, the catalogue states that there is not the slightest danger of its depletion. As for the Mexican supply, it is stated that "the surface has hardly been scratched; statements to the contrary are pure propaganda" Views showing the construction of the devices and appliances that go to make up the system are illustrated with explanatory notes. Size 8½ x 11½ in. Pp. 44.

C. B. J. Snyder to Continue as Architect and Superintendent of School Buildings in New York City.

A report, widely circulated, that C. B. J. Snyder, for over 30 years architect and superintendent of school buildings in New York, had retired is entirely erroneous. The report was that Mr. Snyder's resignation was to take effect as of July 1 and that he would receive a pension of $5500, which is one-half of the regular salary he has received for years.

The facts are that Mr. Snyder pre-

EXHIBIT OF SARCO COMPANY AT CHEMICAL INDUSTRIES EXPOSITION.

sented his resignation which, however, the board refused to accept. Instead it granted Mr. Snyder a three-months vacation at full pay, with the understanding that he would continue in his position. This arrangement was finally agreed upon.

It is stated of Mr. Snyder that he has planned and constructed more school buildings in any one city than any other man. These have involved hundreds of millions of dollars. He was the original designer of the H-type of school building, providing a maximum of light and air.

Eighth National Exposition of the Chemical Industries.

Some idea of the extent to which manufacturers of apparatus and appliances used in the heating and ventilating industry are also interested in the chemical industrial field is given in the list of exhibitors at the recent Eighth National Exposition of the Chemical Industries, at the Grand Central Palace, New York, during the week of September 11.

Among these exhibitors were the American Steam Gauge & Valve Mfg. Co., Boston, Mass.; American Steam Pump Co., Battle Creek, Mich.; Carrier Engineering Corporation, Newark, N. J.; Bailey Meter Co., Cleveland, O.; Crane Co., Chicago; W. L. Fleisher Co., New York; Grinnell Co., Inc., Providence, R. I.; Nash Engineering Co., South Norwalk, Conn.; Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.; Sarco Co., New York; B. F. Sturtevant Co., Hyde Park, Boston, Mass.; Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.; and the Whitlock Coil Pipe Co., Hartford, Conn.

Deaths

T. K. McKnight, manager of the Crane Company's Cleveland office, died suddenly of heart failure in Cleveland, September 16. He was 58 years old and had been associated with the Crane Company for the past 20 years.

John H. Flagler, founder and general manager of the National Tube Co., McKeesport, Pa., died September 8th at his home in Greenwich, Conn., from pneumonia. He was 70 years old. Mr. Flagler was identified with the National Tube Company almost from the time of its beginning in 1868. He developed a new method of uniform heat treatment which came into extensive use in the manufacture of steel and also had a hand in the introduction of gas for furnace use. At the time of his death he was a director of the National Bank of North America and the American Union Life Insurance Company. Besides his widow, he leaves a daughter, sister and brother, Harvey K. Flagler.

Harrie D. Crane, president of the M. H. Crane Estate, Cincinnati, O., and a well-known heating engineer, died September 15 at his home in Avondale, a suburb of Cincinnati, after an illness extending over several years. He was 68 years old. Mr. Crane was the son of M. H. Crane, founder of the heating and ventilating firm of Crane & Company. All of his business career, extending over 40 years, was devoted to his father's company. Mr. Crane was a former president of the American Society of Heating and Ventilating Engineers, as well as one of its charter members. He was a prominent member of the Cincinnati Business Men's Club, and had served on its board of directors and on many of its committees, notably its special Santa Claus Committee. In his earlier years he was prominently identified with the Avondale Athletic Club and was at one time manager of its baseball club which achieved considerable prominence in the heydey of its career. Mr. Crane was one of the original stockholders of the Heating and Ventilating Magazine Company.

Charles G. Armstrong, head of the firm of Charles G. Armstrong & Son, consulting engineers, New York, died at his home in Jersey City, September 11. He was a member of the A. I. E. E. and A. S. R. E. and was also well known among heating and ventilating engineers. He was the author of the report on the heating and ventilating of the New York City public schools which created such a stir about ten years ago. At the time of his death he had just completed an oil-burning installation for James McCreery & Co., New York.

CORNER OF EXHIBIT HALL, CHEMICAL INDUSTRIES EXPOSITION, SHOWING DISPLAYS OF SHAEFFER BUDENBERG MFG. COMPANY.

Developments in the Fuel Situation

Events have moved rapidly since the settlement of the hard-coal strike September 7 when the miners went back to work at the old scale under an agreement which will continue, at least, during the present winter. A revised priority order has been issued by the Interstate Commerce Commission supplanting the order published in last month's issue. Changes have also been made in the personnel of the National Fuel Administration, National Fuel Distributor Henry B. Spencer having resigned. His place was filled by the appointment of Charles B. Spens.

Finally, the pending bill providing for a national coal commission has become a law. As the bill was passed there is to be a commission of seven members, at a salary of $7500 each. No member of Congress may be appointed a member. The amendment put in by the Senate, providing that no member of the Cabinet should be eligible, was struck out. The most difficult point to reconcile was the question of authorizing the commission to investigate the nationalization of the coal mines. As finally agreed on, the bill authorizes the commission to make recommendations as to the advisability of any legislation having to do with government or private ownership, regulation or control. The appropriation is $200,000.

SCOPE OF FUEL DISTRIBUTOR'S AUTHORITY.

The coal distribution and anti-profiteering bill which finally became law on September 16 creates the office of Federal fuel distributor and authorizes him to ascertain whether there is any shortage of coal or other fuel in the United States and the extent of such shortage; the fields of production of coal, the principal markets to which it is taken, and means and methods by which it is distributed; the usual prices, and whether the current prices are just and reasonable; and the nature and location of the customers, which of them need priorities, etc. When he has so ascertained the facts, he is to make recommendations to the Interstate Commerce Commission.

The Intersate Commerce Commission is authorized to issue orders for priorities in car service, embargoes, and other suitable measures in favor of or against any carrier, including vessels suitable for transporting coal, on inland waters, or against any region, municipality, community, person, partnership, or corporation. It may also take other steps necessary and appropriate for the priority in transportation and the equitable distribution of coal so as to meet the national emergency which the bill declares to exist, and so as to prevent the sale of coal at unreasonable prices.

The law is to be in force for one year. $250,000 is appropriated for the fuel distributor.

Revised Priority Order Issued by Interstate Commerce Commission, September 19, 1922.

(Service Order No. 25).

The new order limits the extent of the emergency to the section of the country "east of the Mississippi River, including the west bank crossings thereof." In this territory it is ordered:

1. That preference and priority be given by all common carriers by railroad to food for human consumption, feed for live stock, live stock, perishable products, mine supplies, medicines, fertilizers, seeds, newsprint paper, coal, coke and other fuel, and petroleum and its products in tank cars."

2. That preference be given in returning cars to those used for the transportation of the above-mentioned products.

3. That the railroads which serve coal mines, whether located upon the line or lines of any such railroad or customarily dependent upon it for car supply, are directed and authorized, whenever unable to supply all uses in full, "to furnish such coal mines with open-top cars suitable for the loading and transportation of coal, in preference to any other use, supply or distribution of such cars." A note is added that the phrase "open-top cars suitable for the loading and transportation of coal" does not include flat (fixed) bottom gondola cars with sides 42 in. or less in height, or cars equipped with racks, or cars which on July 1, 1922, had been definitely retired from service for the transportation of coal and stenciled or tagged for other service.

4. That railroads other than coal carriers are to make regular daily deliveries to the coal-carrying roads of empty coal cars up to their maximum ability and of the coal carriers to receive and use them.

5. That the roads discontinue the use of open top cars as described for the transportation of commodities other than coal so long as any coal mine remains to be served by it with such cars. An exception is made to this when such supplies as road building construction materials, ore, mine supplies for current operation and fluxing stone for furnaces are to be transported in the direction of but not beyond the mine or mines to which such open-top cars are destined. Shippers must load such cars within 24 hours after placement for such loading.

6. That the railroads are authorized and directed to place an embargo against the receipt of coal or other freight transported in open-top cars suitable for coal loading, by any consignee and against the placement of such open-top cars for consignment to any consignee, who shall fail or refuse to unload such coal or other freight so transported in coal cars and placed for unloading, within 24 hours, until all coal or other freight so transported in coal cars and so placed has been unloaded by such consignee and shall notify the commission of such action. This it is added, shall not interfere with the movement of coal to tidewater or the Great Lakes for trans-shipment by water, nor shall it apply where the failure of the consignee to unload is due directly to errors or disabilities of the railroad in delivering cars.

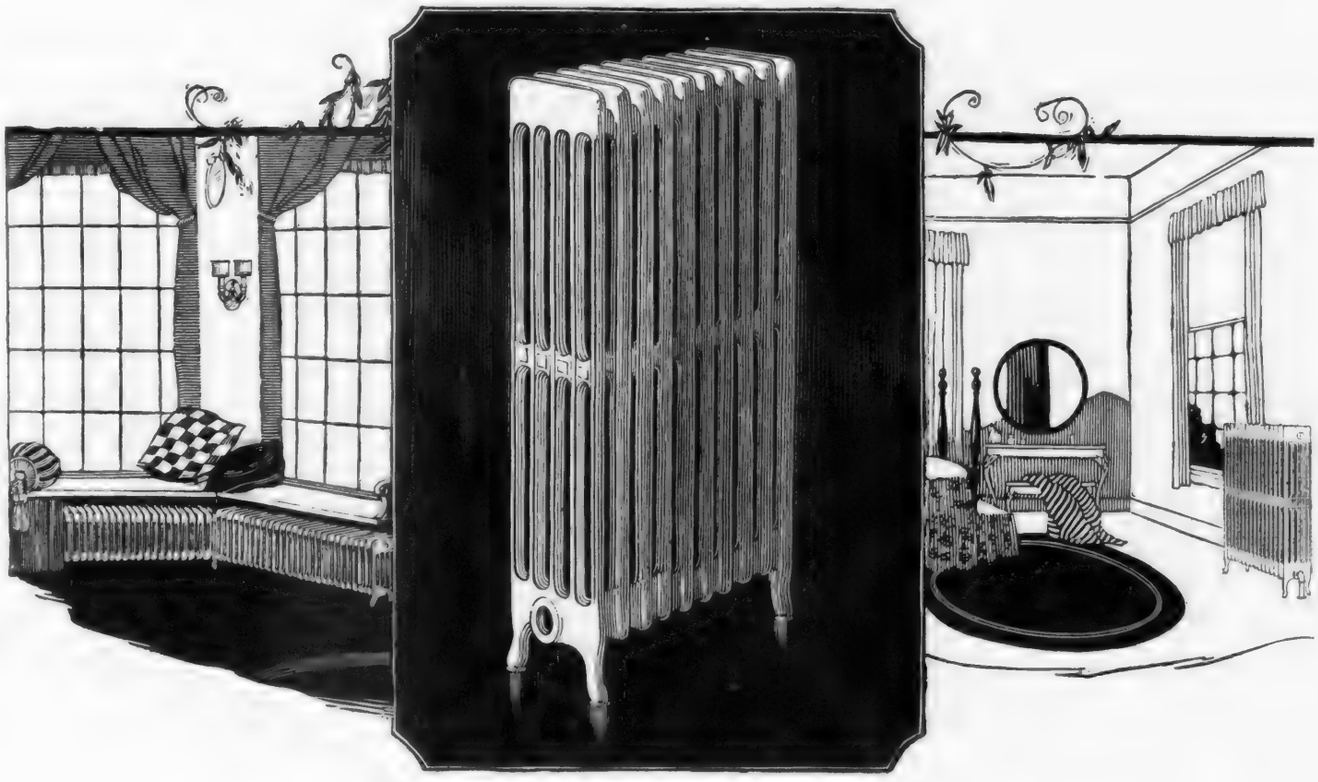
7. That in the supply of cars to mines, each railroad is directed to place, furnish and assign the coal mines with open-top cars suitable for the loading and transportation of coal for such special purposes as may from time to time be specially designated by the commission. Where this is done, however, they shall not be subject to reconsigment or diversion except with the approval of the commission.

National Fuel Administration.

Charles B. Spens, National Fuel Distributor.

STATE FUEL AGENCIES.

Alabama—Roy R. Cox, Fuel Administrator, Mongomery.
Arizona—
Arkansas—
California—
Colorado—
Connecticut—Public Utilities Commission, Hartford.
Delaware—Leon Walker, chairman Delaware Coal Commission, 1020 Church St., Wilmington.
District of Columbia—Public Utilities Commission, Washington.
Florida—Florida Railroad Commission, Tallahassee.
Georgia—Railroad Commission of Georgia, Atlanta.
Idaho—
Illinois—Robert M. Medill, Fuel Administrator, 2001 City Hall Square Building, Chicago.
Indiana—Public Service Commission, Indianapolis.
Iowa—Charles Webster, Fuel Administrator, Des Moines.
Kansas—Court of Industrial Relations, Topeka.
Kentucky—J. Sherman Cooper, Chairman Kentucky Railway Commission, Frankfort.
Louisiana—John G. O'Kelly, Fuel Distributor, 304 Citizens Bank Building, New Orleans.
Maine—Andrew P. Lane, Fuel Director, Augusta.
Maryland—William Milnes Maloy, chairman Public Service Commission, Baltimore.
Massachusetts—James J. Storrow, Fuel Administrator, Boston.
Michigan—William W. Potter, Fuel Administrator, Lansing.
Minnesota—Ivan Bowen, Fuel Administrator, St. Paul.
Mississippi—Mississippi Railroad Commission, Jackson.
Missouri—Hugh McIndoe, Chairman Coal Distribution Committee, Jefferson City.
Montana—
Nebraska—State Railway Commission, Lincoln.
Nevada—
New Hampshire—Charles M. Floyd, Fuel Administrator, Manchester.
New Jersey—William T. Grier, chairman State Fuel Commission, Trenton.
New Mexico—
New York—William H. Woodin, New York State Fuel Administrator, 165 Broadway, New York.
North Carolina—State Corporation Commission, Raleigh.
North Dakota—State Railroad Commission, Bismarck.
Ohio—George T. Poor, chairman Ohio Fuel Commission, Columbus.
Oklahoma—
Oregon—
Pennsylvania—Pennsylvania Fuel Commission, Harrisburg.
Rhode Island—George H. Webb, Fuel Administrator, Providence.
South Carolina—State Railroad Commission, Columbia.
South Dakota—J. J. Murphy, Fuel Administrator, Pierre.
Tennessee—Wilbur A. Nelson, chairman Tennessee Coal Commission, Nashville.
Texas—
Utah—
Vermont—Hugh J. M. Jones, Fuel Administrator, Montpelier.
Virginia—Major Alexander Forward, Fuel Administrator, Richmond.
Washington—
West Virginia—J. Walter Barnes, Fuel Commissioner, Charleston.
Wisconsin—Edward Norman, chairman State Coal Committee, Madison.
Wyoming—



How much is 11 cents a foot?

CORTO RADIATORS—graceful, compact, coal-saving—are named for the famous French engineer, Courtot, who developed them after years of experiment.

Their cost to the home builder averages 11 cents a foot more than ordinary radiators.

In an average home there are from 350 to 1000 feet of radiation—an average difference of only $38.50 to $110 for the whole house.

Surely the added beauty would be worth the added cost even if CORTO RADIATORS were not more efficient.

But they are.

To Architects and Heating Engineers who have plans for private homes or larger buildings under way we invite special consideration of the CORTO RADIATOR. Your request to either address below will bring you a finely illustrated booklet giving full specifications of its varied types and sizes.

AMERICAN RADIATOR COMPANY

IDEAL Boilers and AMERICAN Radiators for every heating need

AMERICAN IDEAL RADIATORS BOILERS

104 West 42nd Street, New York Dept. 106 816 So. Michigan Avenue, Chicago

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

RADIATION COMPUTING.

Heating-Hot Water-

18" Brick Wall Lath, furring and plaster on inside

Net Exp. Wall	Direct Radiation S. or S.E.	N. or N.W.	W. or N.E.	E. or S.W.	Net Exp. Wall	Direct Radiation S. or S.E.	N. or N.W.	W. or N.E.	E. or S.W.
20	3	3	3	3	900	118	144	131	123
40	5	6	6	5	920	116	147	134	126
60	8	10	9	8	940	118	150	137	129
80	10	13	12	11	960	120	154	140	131
100	13	16	15	14	980	123	157	143	134
120	15	19	17	16	1000	125	160	145	137
140	18	22	20	19	1020	128	163	148	139
160	20	26	23	22	1040	130	166	151	142
180	23	29	26	24	1060	133	170	154	144
200	25	32	29	27	1080	135	173	157	147
220	28	35	32	30	1100	138	176	160	150
240	30	38	35	32	1120	140	179	163	152
260	33	42	38	36	1140	143	182	166	155
280	35	45	41	38	1160	145	186	169	158
300	38	48	44	42	1180	148	189	172	162
320	40	51	46	44	1200	150	192	175	164
340	43	54	49	47	1220	153	195	178	167
360	45	58	52	50	1240	155	198	181	170
380	48	61	55	52	1260	158	202	184	172
400	50	64	58	55	1280	160	205	186	175
420	53	67	61	58	1300	163	208	189	178
440	55	70	64	60	1320	165	211	192	180
460	58	74	67	63	1340	168	214	195	183
480	60	77	70	66	1360	170	218	198	186
500	63	80	73	69	1380	173	221	201	189
520	65	83	75	71	1400	175	224	204	191
540	68	86	78	74	1420	178	227	207	194
560	70	90	81	77	1440	180	230	210	197
580	73	93	84	79	1460	183	234	213	199
600	75	96	87	82	1480	186	237	215	202
620	78	99	90	84	1500	188	240	218	204
640	80	102	93	87	1520	190	243	221	207
660	83	106	96	90	1540	193	246	224	210
680	85	109	99	92	1560	195	250	227	212
700	88	112	102	95	1580	198	253	230	215
720	90	115	105	98	1600	200	256	233	218
740	93	118	108	102	1620	203	259	236	221
760	95	122	111	104	1640	205	262	239	224
780	98	125	114	107	1660	208	266	242	227
800	100	129	116	110	1680	210	269	245	230
820	103	131	119	112	1700	213	272	248	232
840	105	134	122	115	1720	215	275	251	235
860	108	138	126	118	1740	218	278	254	238
880	110	141	128	120	1760	220	282	256	240

P.H.C.

RADIATION COMPUTING—Water Heating, 18-In. Brick Wall. | No. 13-U.

Copies of this Data Sheet, printed separately, 5 cents each.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

RADIATION COMPUTING.

Heating - Hot Water -

21" Brick Wall Lath, furring and plaster on inside

Net Exp. Wall	Direct Radiation S. or S.E.	N. or N.W.	W. or N.E.	E. or S.W.	Net Exp. Wall	Direct Radiation S. or S.E.	N. or N.W.	W. or N.E.	E. or S.W.
20	3	3	3	2	900	104	126	117	108
40	5	6	5	5	920	106	129	120	110
60	7	8	8	7	940	108	132	122	113
80	9	11	10	10	960	111	134	125	116
100	12	14	13	12	980	113	137	128	118
120	14	17	16	14	1000	115	140	130	120
140	16	20	18	17	1020	118	143	133	122
160	18	22	21	19	1040	120	146	135	126
180	21	25	23	22	1060	122	148	138	127
200	23	28	26	24	1080	124	151	141	130
220	25	31	29	26	1100	127	154	143	132
240	28	34	31	29	1120	129	157	146	134
260	30	36	34	31	1140	131	160	149	137
280	32	39	36	34	1160	134	162	151	139
300	35	42	39	36	1180	136	165	154	142
320	37	45	42	38	1200	138	168	156	144
340	39	48	44	41	1220	141	171	159	146
360	42	50	47	43	1240	143	174	162	149
380	44	53	49	46	1260	145	176	164	151
400	46	56	52	48	1280	148	179	167	154
420	48	59	55	50	1300	150	182	169	156
440	51	62	57	53	1320	152	185	172	158
460	53	64	60	56	1340	155	188	175	161
480	55	67	62	58	1360	157	190	177	163
500	58	70	65	60	1380	159	193	180	166
520	60	73	68	62	1400	162	196	182	168
540	62	76	70	65	1420	164	199	185	170
560	64	78	73	67	1440	166	202	188	173
580	67	81	75	70	1460	168	204	190	176
600	69	84	78	72	1480	171	207	193	178
620	71	87	81	74	1500	173	210	195	180
640	74	90	83	77	1520	175	213	198	182
660	76	92	86	79	1540	178	216	201	185
680	76	95	89	82	1560	180	218	203	187
700	81	98	91	84	1580	182	221	206	190
720	83	101	94	86	1600	184	224	209	192
740	85	104	96	89	1620	187	227	211	194
760	88	106	99	91	1640	189	230	214	197
780	90	109	102	94	1660	191	232	216	199
800	92	112	104	96	1680	194	235	219	202
820	95	115	107	98	1700	196	238	222	204
840	97	118	109	101	1720	198	241	224	206
860	99	120	112	103	1740	201	244	227	209
880	102	123	115	106	1760	203	246	229	211

B.M.C.

RADIATION COMPUTING—Water Heating, 21-In. Brick Wall. | No. 13-V.

Copies of this Data Sheet, printed separately, 5 cents each.

THE HEATING AND VENTILATING MAGAZINE—1133 BROADWAY, N. Y. CITY

RADIATION COMPUTING.

Heating Hot Water
24" Brick Wall Lath, furring and plaster on inside

Net Exp. Wall	Direct Radiation S. or S.E.	N. or N.W.	W. or N.E.	E. or S.W.	Net Exp. Wall	Direct Radiation S. or S.E.	N. or N.W.	W. or N.E.	E. or S.W.
20	2	3	2	2	900	90	117	108	99
40	4	5	5	4	920	92	120	110	102
60	6	8	7	7	940	94	122	112	104
80	8	10	9	9	960	96	126	115	106
100	10	13	12	11	980	98	128	117	108
120	12	16	14	13	1000	100	130	120	111
140	14	18	17	15	1020	102	133	122	113
160	16	21	19	18	1040	104	135	124	115
180	18	23	22	20	1060	106	138	126	117
200	20	26	24	22	1080	108	141	129	119
220	22	29	26	24	1100	110	143	131	121
240	24	31	29	26	1120	112	146	134	124
260	26	34	31	29	1140	114	149	136	126
280	28	36	34	31	1160	116	151	138	128
300	30	39	36	33	1180	118	154	141	131
320	32	42	38	35	1200	120	156	143	133
340	34	44	41	37	1220	122	159	146	135
360	36	47	43	40	1240	124	162	148	137
380	38	49	46	42	1260	126	164	160	139
400	40	52	48	44	1280	128	167	153	142
420	42	55	50	46	1300	130	169	156	144
440	44	57	53	48	1320	132	172	158	146
460	46	60	55	51	1340	134	175	160	148
480	48	62	58	53	1360	136	177	162	151
500	50	65	60	55	1380	138	180	166	153
520	52	68	62	57	1400	140	182	167	155
540	54	70	65	59	1420	142	185	170	157
560	56	73	67	62	1440	144	188	172	159
580	58	75	70	64	1460	146	190	174	162
600	60	78	72	66	1480	148	193	176	164
620	62	81	74	68	1500	150	195	179	166
640	64	83	76	71	1520	152	198	181	168
660	66	86	79	73	1540	154	201	184	171
680	68	89	81	75	1560	156	203	186	173
700	70	91	84	77	1580	158	206	188	175
720	72	94	86	79	1600	160	209	191	177
740	74	96	88	82	1620	162	211	193	179
760	76	99	91	84	1640	164	214	196	182
780	78	102	93	86	1660	166	216	198	184
800	80	104	96	88	1680	168	219	200	186
820	82	107	98	91	1700	170	222	203	189
840	84	109	100	93	1720	172	224	205	191
860	86	112	103	95	1740	174	227	208	193
880	88	115	105	97	1760	176	229	210	196

D.H.C.

RADIATION COMPUTING—Water Heating, 24-In. Brick Wall. No. 13-W.

Copies of this Data Sheet, printed separately, 5 cents each.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

RADIATION COMPUTING.

Heating-Hot Water

16" Stone or Concrete Wall. Lath, furring and plaster on inside

Net Exp. Wall	Direct Radiation S. or S.E.	N. or N.W.	W. or N.E.	E. or S.W.	Net Exp. Wall	Direct Radiation S. or S.E.	N. or N.W.	W. or N.E.	E. or S.W.
20	5	6	5	5	900	212	268	243	225
40	9	12	11	10	920	216	269	248	230
60	14	17	16	15	940	220	275	254	235
80	19	23	22	20	960	226	280	259	240
100	24	29	27	25	980	230	286	266	245
120	28	35	32	30	1000	235	292	270	250
140	33	41	38	35	1020	240	298	275	255
160	38	46	43	40	1040	244	304	281	260
180	42	52	49	45	1060	249	309	296	265
200	47	58	54	50	1080	254	316	291	270
220	52	64	59	55	1100	259	321	297	275
240	56	70	65	60	1120	263	327	302	280
260	61	75	70	65	1140	268	333	308	285
280	66	81	76	70	1160	273	338	314	290
300	71	87	81	75	1180	277	344	320	295
320	75	94	86	80	1200	282	350	324	300
340	80	100	92	85	1220	286	356	329	305
360	85	105	97	90	1240	291	362	335	310
380	89	112	103	95	1260	296	367	340	316
400	94	118	108	100	1280	301	373	346	320
420	99	124	113	105	1300	306	379	351	326
440	103	130	119	110	1320	310	385	356	330
460	108	135	124	115	1340	315	391	362	335
480	113	141	130	120	1360	320	396	367	340
500	118	147	135	125	1380	324	402	373	345
520	122	153	140	130	1400	329	408	378	350
540	126	159	146	135	1420	334	414	383	355
560	132	164	151	140	1440	338	420	389	360
580	136	170	157	145	1460	343	425	394	365
600	141	176	162	150	1480	348	431	400	370
620	146	182	167	155	1500	353	437	405	375
640	150	188	173	160	1520	357	443	410	380
660	155	193	178	165	1540	362	449	416	385
680	160	199	184	170	1560	366	454	421	390
700	164	206	189	175	1580	371	460	427	395
720	169	211	194	180	1600	376	466	432	400
740	174	217	200	185	1620	381	472	437	406
760	179	222	205	190	1640	385	478	443	410
780	183	228	211	195	1660	390	483	448	415
800	188	234	216	200	1680	395	489	454	420
820	193	240	221	205	1700	400	495	459	425
840	197	246	227	210	1720	404	501	464	430
860	202	251	232	215	1740	409	506	470	435
880	207	257	238	220	1760	414	511	475	440

P.A.C.

RADIATION COMPUTING—Water Htg., 16-in. Stone or Concrete Wall No. 13-X

Copies of this Data Sheet, printed separately, 5 cents each.

EFFICIENT HEATING *demands the* JENNINGS PUMP

DUPLEX "D" UNIT
CONTINUOUS
OPERATION

Lowe's State Theater,
Seventh and Broadway,
Los Angeles, Calif.

Capacity each pump 40,000 sq. ft. direct radiation, air capacity 25 cubic feet per minute in addition to a water capacity of 60 gallons per minute. The Motors are only 3 Horse Power.

THE Jennings Pump consists of two independent turbine units, an air pump and a water pump. As each material is handled separately, the boiler pressure is against the water only. The air and vapor, approximately four-fifths of the volume handled, are delivered to atmosphere without back pressure. The saving in horse power is over fifty per cent. In other words, the cost of current to operate is cut in half.

Because of its compact design, this equipment can be installed in less than one-third the space necessary with other apparatus. All interior parts are bronze, supported on annular ball bearings mounted outside of casing. Moving parts revolve without contact.

Quiet, reliable operation without annoyance because of shut downs, and minimum of expense for repairs, is assured if the Jennings Hytor Vacuum Heating Pump is installed on your Vacuum Heating System.

There are many other reasons why the Jennings is being installed on practically all of the big jobs. Bulletin No. 15 gives them in detail. Write for it.

THE NASH ENGINEERING CO
Plant and General offices
SOUTH NORWALK, CONN.

SALES OFFICES

BOSTON—185 Devonshire Street
BUFFALO—1044 Ellicott Square
CHICAGO—1220 Monadnock Block
CLEVELAND—326 Frankfort Ave. N. W
DALLAS—Dallas Bank Building
DENVER—Boston Building
DETROIT—Kerr Building
HOUSTON—Southern Pacific Building
INDIANAPOLIS—Hume-Mansur Bldg.
KANSAS CITY—Mutual Building
LOS ANGELES—218 East Third Street
MINNEAPOLIS—501 S. Sixth Street
MONTREAL—84 Inspector Street
NEW ORLEANS—521 Baronne Street
NEW YORK—350 Madison Ave.
PHILADELPHIA—Stock ExchangeBldg.
PORTLAND—224 Pine Street
PITTSBURGH—Oliver Building
SALT LAKE CITY—Dooly Building
SAN FRANCISCO—Sharon Building
SEATTLE—220 Railway Exchange
ST. LOUIS—Chemical Building
TOLEDO—136 Huron Street
TORONTO—Kent Building
WASHINGTON—710 14th Street, N. W.

The NASH ENGINEERING COMPANY

SOUTH NORWALK, CONN., U. S. A

TRADE AND MISCELLANEOUS NOTES

Miscellaneous Notes.

National Board of Fire Underwriters has issued a bulletin for those who will have to use substitutes for anthracite coal, cautioning them regarding the fire hazards liable to such use. Among other things the bulletin states: "Bituminous coal very combustible, should not be piled near the furnace or wall of wooden bin. To avoid chimney fires, smoke pipes and flues should be thoroughly cleaned out; furnaces should be encased with fireproof covering, all nearby woodwork should be covered within combustible material, and smoke pipes should be removed at least 18 in. from wood or plaster. The same dangers attend the burning of wood.

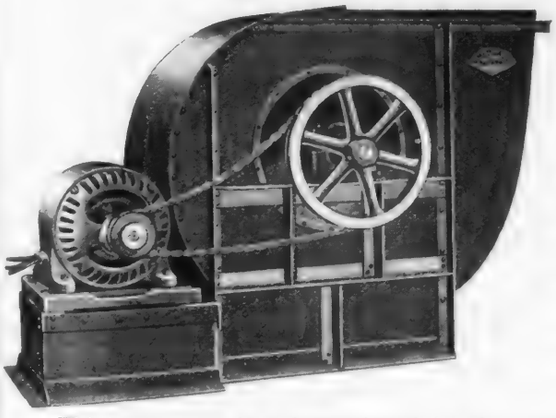
National Association of Stationary Engineers, at its recent convention in Des Moines, Ia., adopted a resolution in favor of a national law compelling mine owners to inform the consumer of the number of heat units in each ton of coal. The resolution called upon Congress to enact a coal-labeling law similar to the national pure-food law. The text of the resolution reads, in part, "this convention declares itself in favor of federal legislation to compel coal shippers and jobbers to attach to all bills of lading an analysis of the coal, showing percentage of combustibles, non-combustibles, sulphur and moisture, together with the B. T. U. contained."

Chicago, Ill.—The new minimum heating ordinance, it is announced by Dr. Herman Bundesen, city health commissioner, will be rigidly enforced beginning October 1. The ordinance provides for the maintenance of a minimum temperature in apartments of 60° at 6:30 A. M., 65° at 7:30 and 68° by 8:30, which minimum is to be maintained throughout the day until 10:30 P. M.

Decatur, Ill.—A community heating plant to serve some twenty patrons is about to be put into operation in Decatur by H. S. Gebhart Frank Cruikshank and others, serving the territory between Prairie and North Streets, from Pine Street West to the Wabash tracks. The estimated cost of the plant is $22,000. In the application for permission to lay the mains it is pointed out that the plant will not be a public utility, but a private venture, and not subject, therefore, to the rules and regulations of the Illinois Commerce Commission. It will be owned outright by the property owners who take the service and who will hold undivided shares in proportion to the cost of the plant and the number of users. In the event the use is extended the new users will pay their proportion to the cost of the plant and this money will be divided among the original users. The plant, it is stated, will be operated at cost, after setting aside a reasonable amount for repairs and depreciation. Among the patrons of the system are Robert and Adolph Mueller. The plant will be located in the "waste" low ground on the south side of West North street, along the Wabash tracks. Two boilers will be installed and the mains will run from it east through the alley between William and North Streets to Pine Street, where a tee will be installed for future extension of one or more blocks. Then the main will extend north in

REGISTERED AUTOVENT

To Those Interested in Ventilation and its Many Problems



Every known type of fan application has been and can be satisfactorily and economically handled with Autovent Fan and Blower products.

When you specify Autovent Fans or Uniblade Blowers on your installations, you are not experimenting, but you are obtaining the best ventilating equipment that can be manufactured.

This statement is substantiated by the unsolicited endorsements we are constantly receiving from satisfied users, such as industrial plants, schools, hospitals, etc.

If you are confronted with difficult fan problems, we can be of service to you. Autovent service is at your disposal without obligation or cost.

AUTOVENT FAN & BLOWER CO.
Formerly Batterman-Truitt Co.
730-738 W. Monroe St., Branch Offices in Principal Cities Chicago

Pine Street to the alley between Prairie and William Streets, where another tee will be installed. From this point the line will extend west.

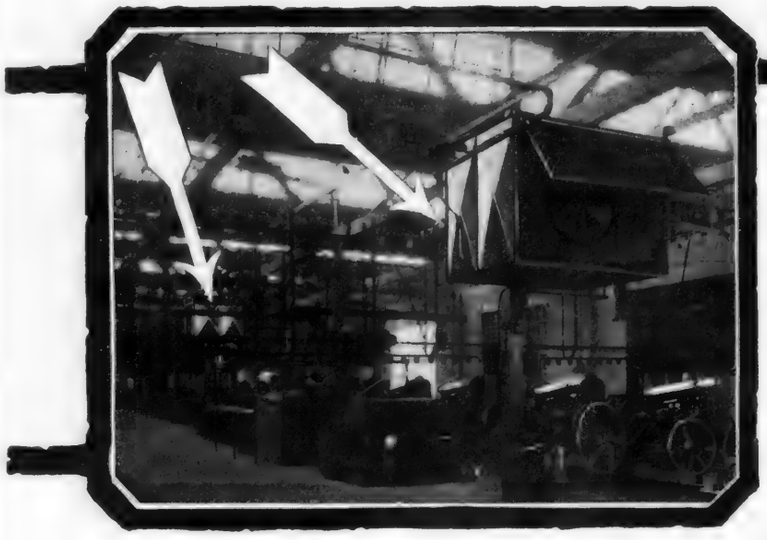
Galveston, Texas.—A central heating and lighting plant for the Medical College buildings of the University of Texas and for the John Sealy Hospital will be built on a plot which the University has recently acquired at the southwest corner of Ninth Street and Avenue A. A new laboratory building is being built between the present college building and the hospital. The cost of the plant and laboratory is estimated at $40,000. The president of the university is Dr. Robert E. Vinson.

Living Costs, according to information gathered by the National Industrial Conference Board, and covering the period from the beginning of the war to July, 1922, have increased 55.6% during that time. The rise of cost of the major items in the wage earners' family budget is estimated to have been as follows: food 42%, shelter 65%, clothing 54%, fuel and light 74%, and sundries 72%. Living costs since March, 1922, showed a slight rise of 0.6%, food having increased 2% and sundries having decreased 1%, while rents, clothing and fuel remained unchanged in price. These changes mean that since July, 1920, when the peak of living costs since 1914 was reached, the total decrease has been 23.9%. Food costs fell 35%, clothing 42% and sundries 7%, while rents have increased 4.5%, and fuel and light 5% since the peak.

Harvard School of Public Health, Boston, Mass., announces that among its courses in industrial hygiene is one on ventilation and illumination. It is in charge of Philip Drinker, B. S., Ch. E., instructor in applied physiology. The course goes on in February, five mornings a week for one month. Among the subjects offered will be the measurement of air flow with different instruments, determinations of humidity, the use of the kata-therometer, experiments in air conditioning, physiological aspects of air conditioning, determination of dust fumes and smokes in air, and physiological and pathological aspects of the above. Further particulars may be had by addressing Susan C. Lyman, secretary, 240 Longwood Avenue, Boston, Mass.

Washington, D. C.—In a statement issued September 8 by the Department of Commerce, data are given to show

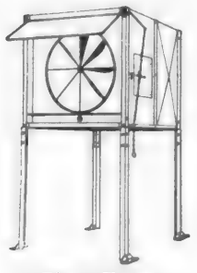
—To The Man Who is Interested In More Heat for Less Money ···



Ford Tractor Plant, Detroit, Michigan

When a mammoth organization like the Ford Tractor Plant makes three installations of ILGAIR Unit Heaters totaling 54 units, it represents an endorsement of one of this country's foremost Industrial plant engineers.

A Valuable Book *for* Architects and Heating Engineere *about* ILGAIR Unit Heaters *Sent on Request*



Floor Type
Note Ceiling Type in Picture

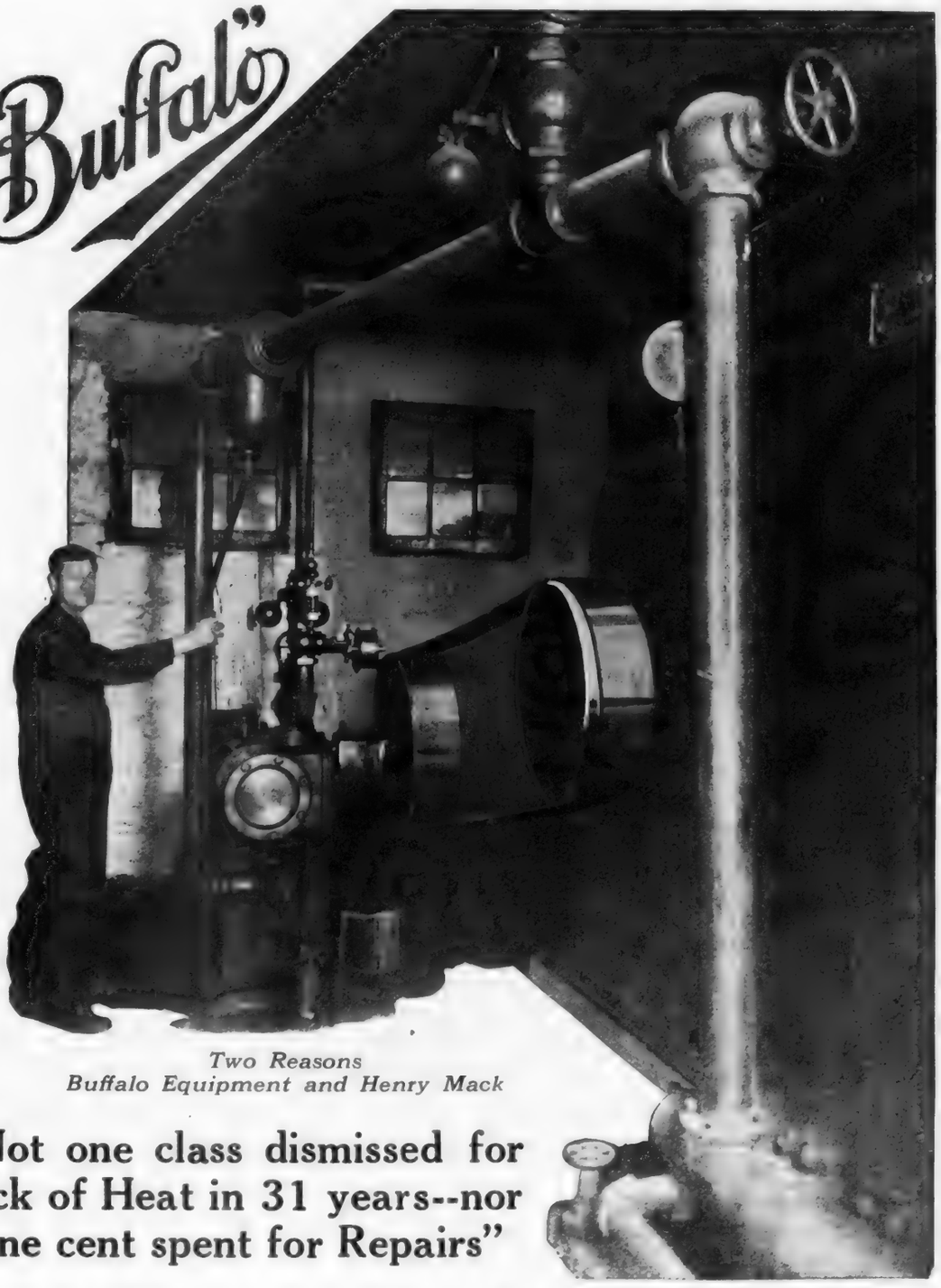
HIGH EFFICIENCY ILG VENTILATING MACHINERY

Ventilation FOR OFFICES · STORES · FACTORIES · PUBLIC BUILDINGS · RESTAURANTS · THEATRES · HOUSES · ETC ·

ILG ELECTRIC VENTILATING CO. 2858 NORTH CRAWFORD AVE. CHICAGO

BRANCHES IN ALL PRINCIPAL CITIES

"Buffalo"



Two Reasons
Buffalo Equipment and Henry Mack

"Not one class dismissed for lack of Heat in 31 years--nor one cent spent for Repairs"

It is nothing unusual for us to hear of Buffalo Ventilating Fans and Engines that have been in use for thirty odd years but seldom are they under the charge of one man as has been the case in the Roosevelt School, Canton, Ohio.

Mr. Mack makes, and the school officials agree to the quoted statement above.

Mr. Mack's community can well be proud of him and his remarkable record of fidelity and efficiency.

We are proud of Buffalo Equipment and would appreciate an opportunity to tell you more about it.

Full data on this equipment furnished by Dept. 36

BUFFALO FORGE COMPANY
BUFFALO, N. Y.

that fundamental business conditions are still sound. "No clearer demonstration could be asked," runs the statement, "to indicate the soundness of the fundamental conditions underlying the present business revival than the persistence with which commerce and industry have progressed in the face of recent serious obstacles. The extremely serious labor difficulties would, under many conditions, have completely demoralized business; instead, real progress continues to be made. There is reason to suppose that the economic losses occasioned by the coal and railroad strike will make themselves felt for some months to come. Disturbances of this character affecting basic industries cannot take place without having to be paid for in the long run. It is possible that the full force of these losses will be felt more severely in future months"

Figures now available on business movements during July show that the rate of progress was materially slackened in that month. In the majority of industries, production and sales were less than in June. A part of this is to be attributed to the usual mid-summer seasonal slump and a part either to approaching over-production or to increased prices and increased production costs.

The extent of the real progress of industry on the road back to normal is seen when current figures are compared with those for a year ago. In almost every instance production is on a much higher level than in 1921. Perhaps the most favorable feature of the present situation is the prospect for a bountiful harvest this fall. This will do much to offset the other less favorable factors.

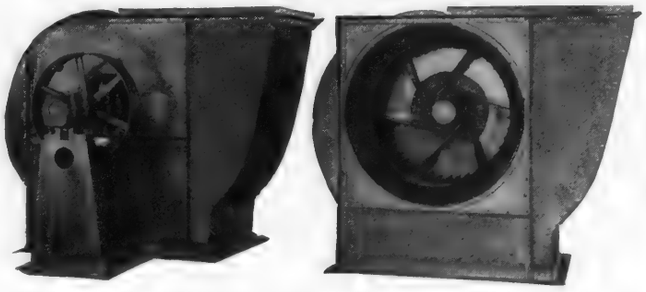
Chamber of Commerce of the United States has set in motion plans by which American business and industry, co-operating with the government, may stabilize the coal situation. The program contemplates co-operation on the part of national business associations, local chambers of commerce and individual corporations and firms in an attempt to equalize and expedite the distribution of coal and to prevent prices from soaring to undue levels. Among the definite steps which the industries will be asked to take are (1) to confine the purchase of coal under present conditions as closely to current needs only as safety permits and (2) to suspend the accumulation of advance stocks of coal until the present emergency pressure on production is relieved. This applies particularly to persons having low-priced contracts and who are, therefore, under no price pressure to withhold immediate delivery. The action of the chamber is at the suggestion of Secretary of Commerce Herbert Hoover.

Washington, D. C.—Figures received by the Department of Commerce up to September 25 indicated that there was no significant recession in business activity during the month of August, in spite of the dislocation caused by the coal and railroad labor difficulty. The building industry, it is stated, showed the effects of the usual seasonal slump but the production of building materials continued at about the same level as in July. The contracts awarded for building construction in the 27 northeastern States increased in the amount of floor space, compared with July. The totals for the last three months are as follows: June, 60,526,000 sq. ft.; July, 51,705,000 sq. ft.; and August 54,019,000 sq. ft. The chief increase in August occurred in industrial building. There was a slight decline in residential construction, although this still constitutes nearly 45% of the total. In spite of the increased floor space the total value of the contracts awarded in August was only $322,007,000, compared to $350,081,000 in July. This decline, it is stated, is evidently due to a cheaper type of construction, although all the data available indicate that material and labor were more expensive in August than in the preceding month.

National Trade Extension Bureau, Evansville, Ind, announces the appointment of George H. Wilson as head of the Accounting Service Department, succeeding George R. Doyle, who has taken up private accounting work as a vocation. For the past five years Mr. Wilson has been auditor of the Ohio Valley Railway Company and secretary and treasurer of the Crescent

LEHIGH

MULTIBLADE FANS



WHERE large volumes of air are to be handled at comparatively low pressures such as in heating and ventilating systems LEHIGH Multiblade Fans are guaranteed to be equal to, if not superior, to any other fans on the market.

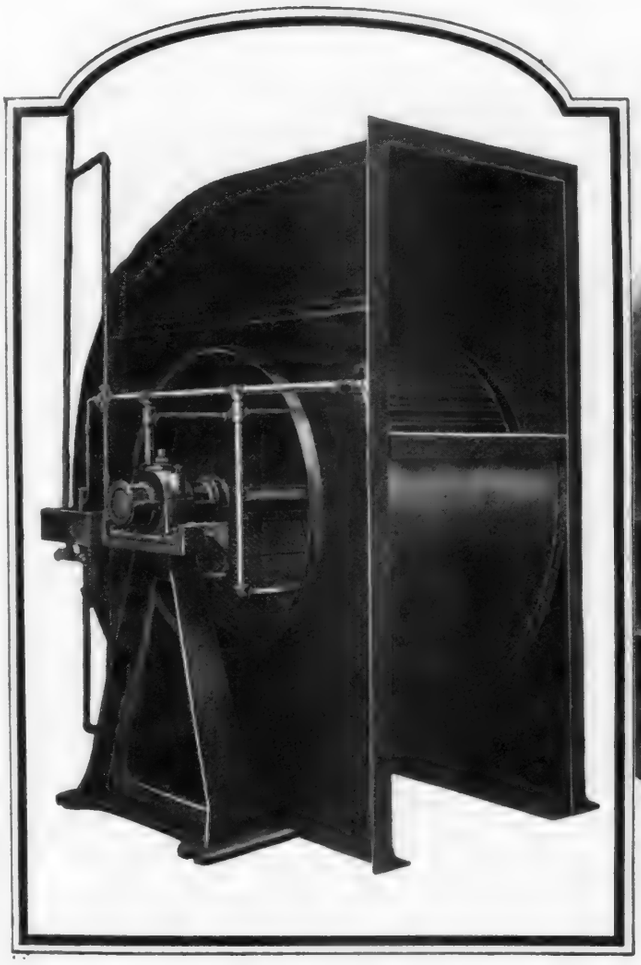
A study of the capacity tables and characteristic curves in the Lehigh catalogue clearly proves this fact.

To further substantiate this statement, your attention is directed to the large inlet and outlet, the cone shaped hub, the absence of stay-rods, the rigid construction secured by special blades running tangent from the hub to the periphery of the wheel and also various other details.

May we send you a copy of our catalogue?

HERSH BROTHERS CO.

654 Mill Street ALLENTOWN, PA.



R. H. White Company, one of Boston's oldest department stores.

Combination Air Washer and Fan for Schools and Buildings

With an operating cost little greater than that of a ventilating fan alone, the A B C Air Washing and Cooling Fan supplies a large volume of pure, fresh air and is particularly adaptable to ventilating school houses and other public buildings.

This combination unit provides a practical system for purifying, washing, and humidifying during the heating season, as well as cooling in warm weather.

If you have not received complete information regarding the A B C Air Washing and Cooling Fan, write today for our special bulletin which contains a detailed description of this unit, together with capacity table and letters of endorsement from users.

GOOD HEALTH WEEK
October 23rd-30th
Ventilation—Sanitation—Personal Hygiene

AMERICAN BLOWER COMPANY, DETROIT
BRANCH OFFICES IN ALL PRINCIPAL CITIES
CANADIAN SIROCCO COMPANY, LIMITED, WINDSOR, ONTARIO
[144]

"Sirocco" Products
TRADE MARK
BLOWERS · EXHAUSTERS · VENTILATING FANS · AIR WASHERS · ENGINES
FOR HEATING, VENTILATING, DRYING, AIR CONDITIONING, MECHANICAL DRAFT

Navigation Company. Mr. Wilson will prepare text books for the use of heating contractors and plumbing dealers who purchased the T. E. B. accounting system.

Central Supply Association will hold its Fall meeting in Chicago, October 18, at the Hotel Sherman, according to an announcement of Secretary Paul W. Blatchford.

American Public Health Association will hold its fifty-first annual meeting in Cleveland, O., October 16-19. The scientific sessions will be held at the Hotel Statler The executive offices of the association which were recently moved from Boston to New York, are at 370 Seventh Avenue New York, A. W. Hedrich being the executive secretary.

American Gas Association will hold its fourth annual convention and exhibit in Atlantic City, N. J., October 23-28. Both the convention quarter and exhibit hall will be on the Steel Pier.

Manufacturers' Notes

Petroleum Heat & Power Co., New York, manufacturer of oil-burning equipment, reports the following New York City installations recently completed or in course of construction:

Fleischmann Company, 158th Street & Mott Avenue.
Pershing Square Building, 42nd Street.
Metropolitan Life Insurance Company, 1 Madison Ave.
John Wanamaker, Inc., Broadway & 10th Street.
San Remo Hotel, Central Park West and 74th Street.
American Lithograph Company, 52 E. 19th St.
Rohe & Brothers, 527 West 36th Street.
Bonwit, Teller & Company, 5th Ave., and 38th St.
Fordham Press, Fordham Road & Bathgate Ave.
Hotel Imperial, Broadway & 32nd Street.
Excelsior Savings Bank, 221 West 57th Street.

American Radiator Co., Buffalo, N. Y. announces that its branch headquarters in Birmingham have been moved to Atlanta, Ga., and will hereafter be known as the Southern Branch. The address is 232 Peachtree St., Atlanta.

Pittsburgh Engineering Co., Jeannette, Pa., manufacturer of the Peco system of vacuum steam heating, is planning to move its business to Lima, O. If this is done the company will spend $40,000 on a new plant. The reason given for the change is that there is little room for expansion at Jeannette and the labor supply is not satisfactory.

M. S. Little Mfg. Co., Hartford, Conn., is the title of the recent merger of the M. S. Little Mfg. Co., of Hartford, and the A. J. Beaton Mfg. Co., of New Briain, Conn., which was recently effected. The deal involved assets totalling $500,000. The machinery and stock of the New Britain concern will be moved to Hartford and the present plant of the M. S. Little Mfg. Company will be used and additions made as necessary. Lack of space for expansion of the A. J. Beaton Mfg. Company is given as the chief reason for the merger. Both concerns are engaged in the manufacture of heating and plumbing supplies. The A. J. Beaton Mfg. Company has long been identified with the heating and plumbing industries. The M. S. Little Mfg. Company was founded in Hartford in 1912 by Mitchell S. Little.

"X" Laboratories, New York, manufacturer of the "X" liquid, announces the appointment of John S. Shirley as its advertising manager. Mr. Shirley has long been in the advertising field, having been connected with the Percival K. Frowert Company of New York and Philadelphia for the past twelve years.

Samuel Sloan & Co., Rochester, N. Y., wholesalers of steam fitting and plumbing supplies, announces the appointment of P. M. Beecher as manager of promotion and sales. Mr. Beecher took up his new duties September 1. He was formerly vice-president of the Pierce, Butler & Pierce Mfg. Company and is a well-known figure in trade circles throughout the country.

Sprague Blower Motors

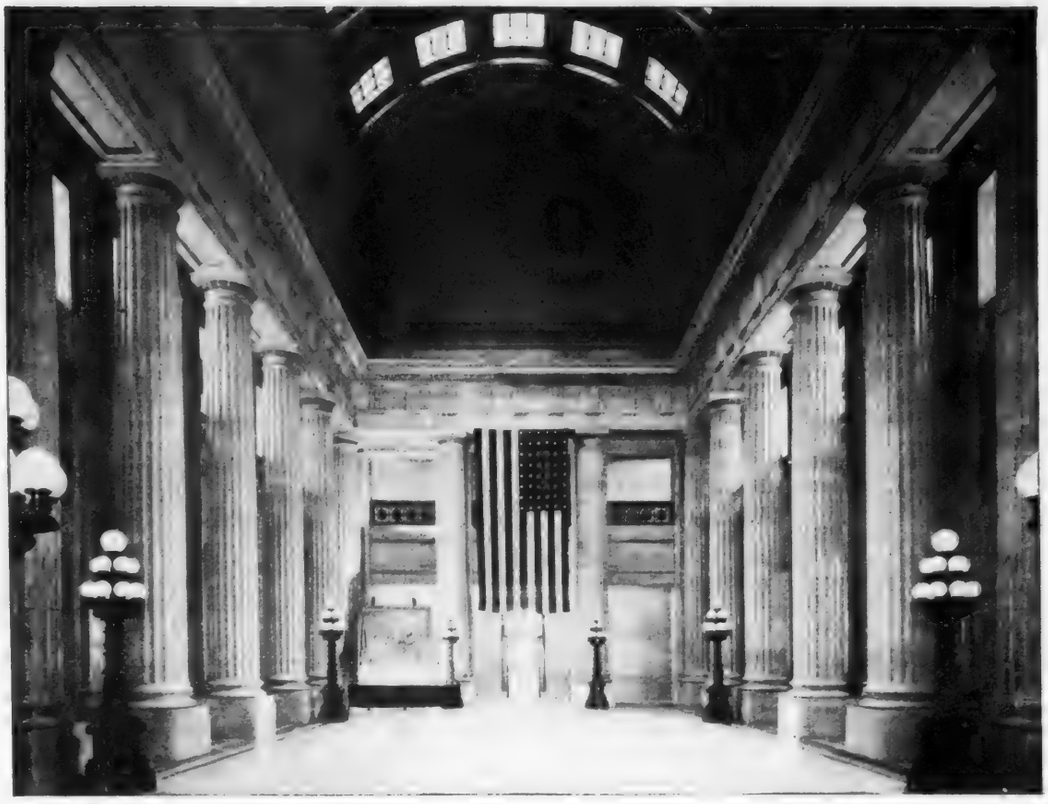
WERE GOOD 20 YEARS AGO

Are Still BETTER Today

Always Use Sprague in Your Ventilating System

Sprague Blower Outfits Still Operating at Macy's Dept. Store, N. Y. City, where they were Installed when Building was Erected some Twenty Years Ago

SPRAGUE ELECTRIC WORKS
Of General Electric Company
Main Offices 527 W. 34th St. New York
PIONEERS OF THE INDUSTRY
Branch Offices in Principal Cities



Cleveland City Hall

The Chafer Company
Heating and Ventilating Contr.

J. Milton Dyer
Architect

Cleveland

This handsome building, a magnificent example of the progress of the fifth city of the country, is heated and ventilated by a Sturtevant System.

The apparatus has now been installed for over five years with never a question as to its satisfaction and reliability.

In summer the air is kept cool and refreshing and in winter a comforting, healthy warmth prevails.

It is in installations such as this that Sturtevant Heating and Ventilating engineers can be of appreciable assistance to the architect and engineer.

The services of our Heating and Ventilating specialists are always at your disposal, without the slightest obligation.

HYDE PARK, BOSTON, MASS 695

Walworth Realty Co., a subsidiary of the Walworth Mfg. Co., Boston, Mass., manufacturer of the Stillson wrench, the Walmanco joint and other steam and gas fittings, tubes, etc., has awarded to Dwight P. Robinson & Co., Inc., the contract for the design and construction of a warehouse, pipe shop and garage to be located on Jackson Avenue, Long Island City, New York. The main building will contain the offices, city sales department, shipping room and space for the storage of fittings and material. The pipe storage building is to be 60 x 214 ft., and will be served by a crane running out over the railroad siding. Construction has already begun.

Sarco Co., Inc., New York, reports orders for 1008 Sarco radiator traps for the Hotel Majestic, New York; 524 radiator traps for the Matson Navigation Building, San Francisco; and nearly 500 radiator traps each for the Police Headquarters in Detroit, the Park Boulevard Office Building in Detroit and the Allerton House, New York.

Utica Heater Co., Utica, N. Y., is erecting a new building to be added to its group at Whitesboro, together with an addition increasing the length of its foundry by 72 ft. This will make the total foundry length about 300 ft. The new building, which will be used as a core room and pattern shop, will be two stories high, of fireproof concrete construction, the dimensions being 52 x 152 ft. On the completion of the work now under way the company will have working facilities for an additional force of 50 employees. This increase, it is stated, has been made necessary by the demand for the company's products which include Imperial Super-Smokeless boilers, Superior warm-air heaters and New Idea pipeless furnaces.

Williams Radiator Co., Los Angeles, Cal., manufacturer of the Williams gas-fired boiler and distributors for the south and west of the Clow Gasteam heating system, announces the appointment of F. A. Palmer as its Los Angeles branch manager. Mr. Palmer was previously connected with the general sales department of the American Radiator Company.

Sterling Engineering Co., Milwaukee, Wis., manufacturer of the Sterling line of heating specialties, has appointed Oscar C. Anderson as the company's Chicago representative, with headquarters at 1702 North Talman Avenue. Mr. Anderson is well acquainted with the Chicago trade, having lived in the Windy City most of his life. He was for thirteen years with the Powers Regulator Company and for two and one-half years with the Fulton Company.

G. F. Elliott, general manager of the Walworth Mfg. Co., 88 Pearl St., Boston, Mass., is chairman of a special plumbing, plumbing supplies and pipe fittings group which will be canvassed for its quota of the $200,000 fund which the Salvation Army is raising to finance its local welfare and relief activities in Boston during the coming year. More than twenty different lines of trade in Boston are already organized in individual groups for this effort. The campaign will go on during the period from October 20 to October 30.

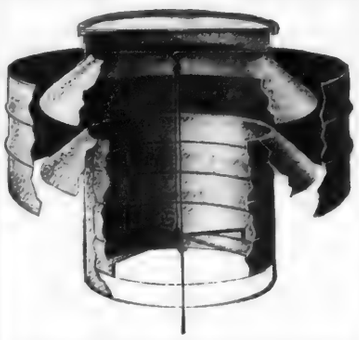
Central Station Heating Notes

Hillsboro, Ill.—Official notice has been sent to all steam heating patrons of the Southern Illinois Light and Power Company in Hillsboro, that the company will discontinue its heating service there after the coming winter. The reason given for the proposed action is that the service cannot be maintained at the present rates, while rates that would be profitable would be too high for the consumers.

Davenport, Iowa.—Steam heating service rates in Davenport will be the same as last year, although the Peoples Light Company, in an announce-

More Proof

that the ***"BURT"*** *is the Ideal Ventilator*



37 installed on the Ohio Salt Co., Rittman, Ohio.

36 installed on the Wadsworth Salt Co. Wadsworth, O. (4th order)

18 Summerville Cotton Mills, Summerville, Ga.

30 Edwards Mfg. Co., Augusta Me. (5th order)

and the number increasing daily!

Impure and hot air, smoke, steam or gas taken out of any building automatically and without any expense other than the first cost of the ventilators.

Ideal Ventilation **with the BURT combination ventilator and skylight having the exclusive feature of a sliding sleeve damper.**

THE BURT MANUFACTURING COMPANY

261 Main St., Akron, Ohio

The

KNOWLES STANDARD AISLE HOOD

is an AIR DEFLECTOR used in auditoriums of theatres, schools and churches under the aisle seats to throw the fresh air out into the aisles in one direction.

It is an inexpensive method of introducing a large volume of air without the possibility of a draught being felt.

Made of Cast Iron

Send for prices Showing sizes

Knowles Mushroom Ventilator Co.

202 Franklin St. New York City

Manufacturers of "Camelback" Air Diffuser and the Notch Mushroom Ventilator

TO INSURE MAXIMUM VENTILATION AT A MINIMUM EXPENSE?

This is a question which is now confronting a large number of School Boards, and which may cause them many hours of worry and regret, not only before they select the type of System, but after same has been installed.

BUCKEYE HEATOVENTS, the ideal Heating and Ventilating Units, will solve the problem, prevent worry, and leave no regrets, as they insure the best of ventilation at the lowest known cost.

In fact, Buckeye Heatovents will save as much as thirty (30) per cent on your ventilation cost, as compared with any other type of ventilating system.

We are in position to make quick shipment of any number of Heatovents, so that you can have them ready for the coming cold months.

Our Engineering and Service Departments are ready to assist or cooperate with any Engineer or Architect by furnishing proper data and information for designing the Unit system for Banks, Offices, Clubs, Lodges, Schools, Churches, Auditoriums, Gymnasiums, etc., without any obligation.

BUCKEYE BLOWER CO.

COLUMBUS, OHIO

BRANCH SALES AND ENGINEERING OFFICES

BUCKEYE BLOWER CO.
324 Monadnock Bldg.
Chicago, Ill.

BUCKEYE BLOWER CO.
533 Wabash Bldg.
Pittsburgh, Pa.

BUCKEYE BLOWER CO.
1400 Broadway
New York, N. Y.

BUCKEYE BLOWER CO.
372 Whitehall St.
Atlanta, Ga.

ment made through C. N. Chubb, general manager of the company, reserves the right to increase the rates if it becomes necessary to pay exorbitant prices for coal. The rates at present are as follows:

First 15,000 lbs. per month, 1.80 gross and $1.62 net per 1000 lbs.

Next 35,000 lbs. per month, $1.25 gross and $1.12½ net per 1000 lbs.

Next 50,000 lbs. per month, $12: $1.20 gross and $1.08 net per 1000 lbs.

Next 50,000 lbs., per month, $1.10 gross and 99 cents per 1000 lbs.

The full text of the announcement which was sent out with the contract for the season from October 1, 1922 to May 30, 1923, was as follows:

Minimum bill, $5.00 per meter per month

The company agrees that if the rates as given furnish a return to the company of more than 8% on the value of its property used and required in the steam heating department, as such value shall finally be determined by the courts or agreed upon between the city and the company, over and above operating expenses, including depreciation, the company will refund such excess so collected above 8% pro rato to the customers in accordance with the customer's consumption. In referring to the coal situation and coal prices the company states the case as follows in a letter accompanying the contract:

"As you can all readily appreciate it has been impossible for us to make a contract for our coal requirements for the steam heating plant because of the nation-wide strike of coal miners, until just recently. A contract has now been made at a material advance over the price paid last year. All contracts, of course, for coal are contingent upon railroad and mining conditions. These are both in a very unsatisfactory state at the present time and although we have a contract for coal at a specified price, there is no assurance that we are to get deliveries or that price now being paid will hold throughout the steam heating season.

"We are not asking for any increase in the rates due to increase in cost of coal, at present, and trust it will not be necessary to do so during the present heating season. However, we feel it is absolutely necessary for us to issue this note of explanation as in case contingencies arise that make it necessary to pay exorbitant prices for coal in order to maintain steam heating service, some increases in rates may be necessary before the season is over."

New Incorporations

Boiler and Radiator Corporation has been **organized in Rochester**, N. Y. with Harry S. Welsh as president and manager, and William F. Devendorf as secretary and treasurer. The new company has taken quarters at 154 East Avenue, Rochester. Mr. Welsh is widely known in heating circles through his position as manager and buyer of the heating department of Samuel Sloan & Co., of Rochester. Mr. Devendorf is a graduate engineer and for many years has conducted a successful heating contracting business in Rochester. The new company will act as direct and exclusive representative for complete lines of boilers, radiators, steam specialties and kindred lines, devoting particular attention to the Kewanee line of heating and power boilers. The company has taken over the assets and several lines previously handled by the Esco Specialties Company, including the Fulton sylphon specialties, the Wickwire Spencer Steel Corporation's products and other products.

Reliance Heating Co., Cleveland, O., capital $10,000. Incorporators: Jacob Helmke, Homer W. Badgett, Floyd E. Shannon, Charles Reis and Charles D. Trout.

Allen-Matthews Co., 1596 East 67 Street, Chicago, Ill., capital $10,000, to manufacture and deal in heating and ventilating and plumbing supplies. Incorporators: Joseph M. Allen, Roy E. Matthews, Freda J. Allen, S. Matthews and A. C. Fordham. Correspondent, Howe, Fordham & Kreamer, 7 South Dearborn Street.

Nugas Corporation, Greenwich, Conn., capital $25,000, to manufacture Heating specialties. Incorporators: A. W. Marshall, 36 Washington St., Green-

THE IMPACT AIR WASHER

Comprises a number of important features.

Highly Effective Dust Removal

The "Impact" Washer is guaranteed to remove 95 per cent of such dust as is found in ordinary city air. Extra-intimate contact of air and water is effected by the use of nozzles of our "Impact" type which due to their special construction and arrangement produce a dense and uniform mist or spray.

Uninterrupted Service

The "Impact" type of nozzle produces a flat, fan-shape spray by the impact of two jets from large smooth orifices, there being no internal spirals or passages whatever to become clogged with sediment. For the further prevention of plugging our special scale arrester is placed just back of each spray head. This arrester with its numerous holes each slightly smaller than the nozzle orifices, intercepts and retains all bits of sediment and scale which would not pass the nozzles. The accumulation on this strainer is slow and is quickly removed while washer is operating.

Other exclusive features. Ask for Booklet K.

THE COOLING TOWER CO., INC.

15 John St., New York

This Book Will Tell You

about Dunham Heating Service

New Edition No. 214 just off the press.

—and in addition, give you heating facts arranged in concrete form for quick reference. Here are a few of the subjects discussed in the Dunham Hand Book.

"Designing heating systems" "Calculating radiation"
"Piping and pipe sizes" "Heat values of fuels"

The Dunham Hand Book is pocket size and was compiled for your personal use. It will be sent to executives of concerns who write for it on their letterheads.

C. A. DUNHAM COMPANY
230 East Ohio Street, Chicago
57 Branches and Local Sales Offices in United States and Canada
Foreign sales offices in London and Paris

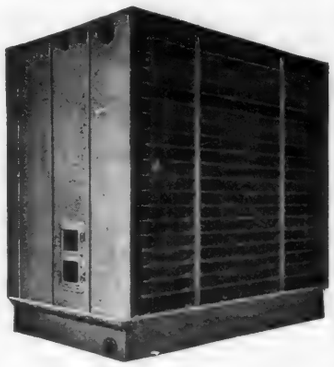
The DUNHAM HEATING SERVICE REG. TRADE MARK

Peerless Ventilator

BUILT RIGHT RUN RIGHT

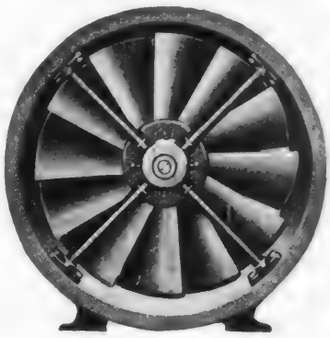
The New York Blower Co.

Chicago, Ill. **La Porte, Ind.**



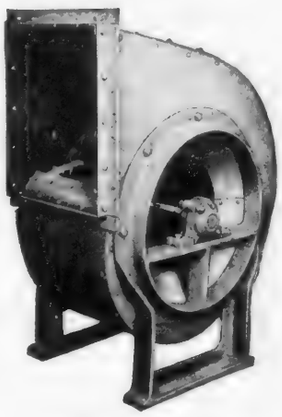
Peerless Air Washer

We manufacture a complete line of fan equipment and appurtenances. By concentrating on this one class of products we are able to make them better every year.



Pulley Driven Disc Fan for Mines

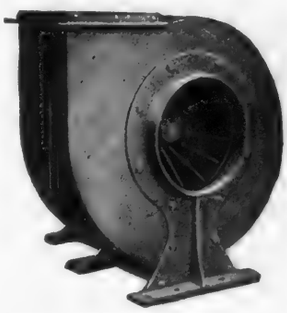
The old fallacy that fan equipment was a luxury is now known to be untrue; it is an economical necessity. We can give actual installations in all kinds of industries where through the wise employment of fan equipment manufacturers have improved the quality of their product, and increased production with a reduction in factory cost.



Type "C" Seri-Vane Fan

If you are interested in drying, humidifying, heating, ventilating, mechanical draft, removal of shavings or similar installations, please communicate with us. If we cannot honestly prove facts to you showing the benefits that will follow from an installation for your special problem, we will frankly so state.

Motor Driven Propeller Fan

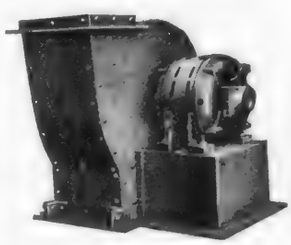


Slow Speed Planing Mill Exhauster

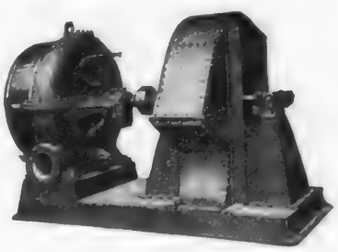
The New York Blower Co.

Chicago, Ill. **La Porte, Ind.**

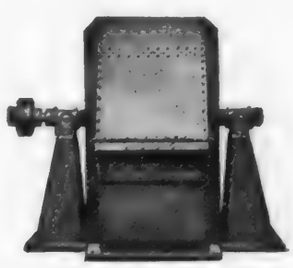
Branch Offices in Principal Cities



High Speed Type "C" Seri-Vane Fan



High Pressure Blower Direct Connected to Turbine



Stoker Fan

wich; L. N. Small and Jules E. Bervard, also of Greenwich.

Automatic Appliance Co., 545 South Dearborn St., Chicago, Ill., capital $100,000, to manufacture heating specialties. Incorporators: C. G. Stromquist, M. Mokate and William N. Brady.

Ackerman & Cedergren, Inc., Minneapolis, Minn., organized to deal in heating and plumbing supplies. Quarters have been secured at 2916 Lyndale Avenue, South. It is stated that this is the first exclusively wholesale concern to locate in the Lake district. O. A. Ackerman, one of the principals, has long been prominent in the wholesale business in St. Paul, while B. H. Cedergren the other principal firm member has been connected with the wholesale heating and plumbing trade in Minneapolis.

Midwest Plumbing & Heating Co., Denver, Colo., capital $50,000. Incorporators: Philip McCarthy, C. H. Johnson and Cliff B. Fryberger.

Elmgren Engineering Co., Hartford, Conn., capital $50,000, to engage in the heating and plumbing contracting business. Incorporators: Clarence J. and Elmer G. Elmgren and Gustav V. Berglund, all of Hartford.

United Plumbing & Heating Supply Co., Milwaukee, Wis., capital $25,000. Incorporators: George J. Rosks, Milwaukee; Hilda Roska, Milwaukee; and Arnold Wangerin, Milwaukee.

Keating Valve Co., Springfield, Mass., capital $50,000, to manufacture heating specialties. Incorporators: Henry L. Bowles, Charles Sumner Vining and Richard J. Talbot, all of Springfield.

New York Plumbing & Heating Supply Co., New Haven, Conn., capital $200,000. President and treasurer, Morris Batter; vice-president, William Batter; secretary, Fred G. Sims; assistant treasurer and assistant secretary, Samuel Batter.

Contracts Awarded

Ed. Eastman Co., Beaumont, Texas, heating and plumbing Anderson School, in Orange, Texas.

Wilmington, Del.—Bids were received as follows for the heating and ventilating of the new high school in Smyrna, Del.: Chesapeake Coppersmith Co., $13,312: Fred P. Merkel, $20,282; J. H. Hutchinson, $17,213; and Burton L. Marke, $16,849.

Scott Co., Oakland, Cal., heating and ventilating the Golden Gate School in Oakland, for $11,566.

Ryan Plumbing & Heating Co., Davenport, Ia., heating twelve hangars being built at the Chanute Flying Fields at Rantoul, Ill., also installing 8100 ft. of steam mains in the streets. The contract price for the work is $147,000. The Ryan Company is also installing a sprinkler system on the piers of the North Star Steamship Line at Hoboken, N. J., at its bid of $74,000.

Chappel-Warren Co., Cleveland, O., installing underground steam line from the Hawthorne Building to the Garden Avenue School in Lorain, O., for $6,582. It is planned to use one heating system in two schools this year, the steam being generated in the Hawthorne Building.

T. E. Thomas, Salt Lake City, Utah, heating and plumbing the $300,000 Webster Gymnasium in Ogden.

Columbus, O.—Walter Spohn was the low bidder, at $100,590, for the heating and plumbing of the six new cottages at the Orient Farm for Feeble-Minded. The plans for the buildings were drawn by Robert S. Harsh, State architect.

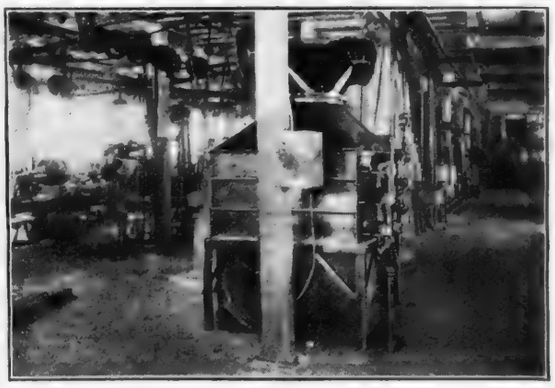
John O'Neil & Son, Peoria, Ill., heating and ventilating Elkhart Community high school in Elkhart, Ill. The cost of the entire structure will be $82,000.

Klingerman Bros., Plymouth, Ind., was the low bidder, at $27,907, for the heating and ventilating of the new school building in Plymouth. In case certain furnaces were required this bid was to be increased by from $3000 to $5000. The company also submitted a bid of $16,042 for the plumbing, gas fitting and sewerage.

Stureman-Butterick Co., Springfield, Ill., heating new Court of Honor building in Springfield, for $6,150.

Eckhart Plumbing & Heating Co., Seattle, Wash., installing a sprinkler system in the warehouse on Pier 3 of the port terminals, for $23,000. The in-

THE BEST SYSTEM OF FACTORY HEATING



— ELIMINATES DISTRIBUTING DUCTS —

WING-SCRUPLEX REG. U.S. PAT. OFF. UNIT HEATERS

located out of the way—will heat the building completely and uniformly—without the use of distributing ducts.

Built in Floor, Ceiling and Wall Types, Steam or Direct-Fired, completely assembled before shipment.

Write for Engineers' Data Book.

L. J. Wing Mfg. Co.

Fans and Blowers — Unit Heaters
Small Turbines — Damper Regulators
HUDSON & 13TH STS., NEW YORK CITY

Vento Return Line Valve

for Vacuum and Vapor Heating Systems is a fuel-saver from the moment that it is put to work on the heating system. It never fails in its promise to make the heating system give dollar-for-dollar service for every ounce of fuel consumed. Our latest Booklet, "The Perfect Heating System," will be mailed on request to any heating engineer.

WM. S. HAINES & COMPANY
PHILADELPHIA

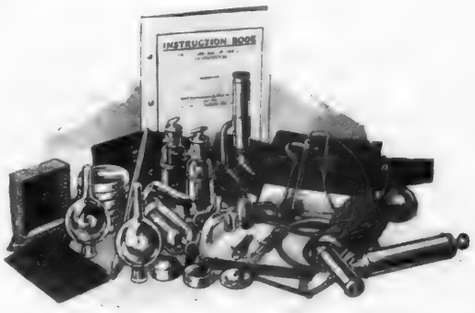
Steam Traps — Steam Separators — Oil Separators — Strainers
Air Traps — Exhaust Heads — Boiler Alarm Water Columns

WRIGHT — WA Standard with STEAM USERS SINCE '94 — AUSTIN

WRIGHT-AUSTIN CO. — DETROIT, MICHIGAN

Men who can not Afford to Guess

The Case now contains the following instruments



1	Dr. Hill Dust Counter complete now recognized as the only practical method of determining the dust content of the air	$85.00
1	Folding Microscope	35.00
6	Petrie Dishes	3.00
1	Odorometer	6.00
1	Amonium-Chloride Machine for studying air currents and determining air motion.	18.50
1	Air Pump (rubber) for collecting air samples	2.50
1	Cotometer a new device for analizing air for CO_2 in the field.	50.00
1	Kopnaerimeter a very accurate instrument for determining air velocity. It has no moving parts.	16.50
1	Whirling Psychrometer	12.00
1	Lufkin Pocket Steel Tape	1.50
1	Psychrometer Chart	.25
1	Book of instructions	2.50
1	Serviceable carrying case, covered with genuine cowhide leather, heavy brass nickel plated fittings, snaps, lock and key	15.00
	Total if purchased separately	$247.75

The above instruments purchased in the case complete $175.00, F. O. B. Chicago. All instruments sold separately if desired.

CONSULTING ENGINEERS, SCHOOL ENGINEERS HEALTH OFFICIALS, and ARCHITECTS find our complete AIR-TEST CASE indispensable.

It is also a necessary part of the teaching equipment of all Technical Schools where ventilation and air conditioning are part of the curriculum.

The case has been redesigned and many of the instruments improved. Also three important new instruments added, namely: the Cotometer, for the simple and accurate determination of CO_2; the Kopnaerimeter for measuring air velocity; and the Whirling Psychrometer.

The heating season is at hand and ventilation problems in the schools, offices and factories now present themselves. Scientific methods and instruments are necessary for their solution.

E. VERNON HILL COMPANY, *Aerologists*
64 W. Randolph Street, Chicago, Illinois.

stallation, it is stated, will save the port $4600 a year in insurance premiums. Other bidders were: Pacific Fire Extinguishing Co., Portland, $23,422: Automatic Sprinkler Co., Portland, $26,000.

William M. Anderson Philadelphia, Pa., heating Garden Pier, Atlantic City, N. J.

Business Changes

Ben Olsen Plumbing & Heating Co., Tacoma, Wash., has increased its capital stock from $5,000 to $50,000, to provide for its growing business.

Kieper & Vockroth, heating and plumbing contractors, Scranton, Pa., have moved into their new building at 521 Wyoming Avenue, Scranton, where they now occupy 6000 sq. ft. of floor space. The business, which was started in 1908, has grown steadily to its present dimensions. The firm is composed of George J. Kieper and Henry A. Vockroth.

Offner & McKnight, consulting engineers for power, heating and ventilating New York, announce their removal to 1182 Broadway, where larger space has been secured for the firm's increased business.

A. J Purcell, Hartford, Conn., for the past thirteen years in the employ of Crane Company, as sales engineer in the company's specialty department, has resigned his position to take up the sale of heating, plumbing and steam specialties, representing several firms as sales agent. Mr. Purcell has established headquarters at 631 New Britain Ave., Hartford.

George M. Breakey, Rochester, N. Y., formerly with the Detroit Edison Company, the Ford Motor Company and Albert Kahn, all of Detroit, has opened an office as a consulting and designing engineer for steam power-plants, heating and ventilating, refrigerating and sanitation, etc., at 70 Reynolds Arcade, Rochester. Manufacturers are asked to send catalogues.

"Better Homes in America" Campaign.

A Nation-wide campaign for "Better Homes in America" is an interesting movement which was scheduled for the week of October 9-14. The idea was developed by the *Delineator* magazine and has enlisted the support of leading government officers, including President Harding, as well as many governors of States.

One of the principal features of the campaign is a "Demonstration Home" whose construction, equipment and furnishing are intended to serve as an object lesson in the use of better methods and household arrangements. While in many cases it would be necessary to select a house not newly built, there is usually the opportunity of obtaining the use of a new house that meets the requirements.

It was urged that the demonstration home selected in any given locality should be one ranging in value from $5,000 to $15,000, including the land, but not including the furnishings and equipment. It was proposed to install in this building many of the labor-saving and other devices and appliances now considered more or less home necessities, while attention was also to be given to the furnishing of the rooms and other details.

In connection with the equipment the suggestions for heating arrangements as sent out by the committee were as follows:

Heating. — Central heating preferred. May be hot air, steam, hot water or vapor. Insulate heater and pipes. Large furnace water pan, or radiator waterpans desirable. Select heating system, using fuel most economical for your locality. Thermostat heat regulator installed in living room is desirable. Write placards describing why you selected this heating plant; why it is so well insulated; why large water pan or radiator water pans are important.

Supplementary Heat.—Open fireplace, Franklin stove or gas logs desirable in living room for beauty and comfort in spring and fall.

ARMCO INGOT IRON is brought to the attention of the ventilating trade through a circular issued by the American Rolling Mill Co., Middletown, O., which shows the ventilators on the roof of the U. S. Playing Card Company's building in Cincinnati, which is accompanied by the statement that all sheet-metal work is of galvanized Armco ingot iron.

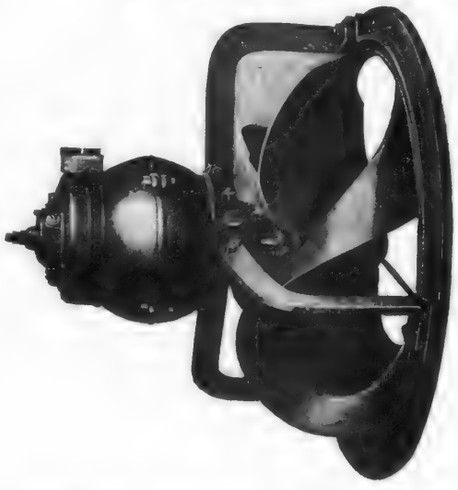
Cycloidal
MULTIVANE FANS
TRADE MARK

Heating and
Ventilating
Apparatus
Fans and
Blowers

Garden City Fan Co.
Manufacturers since 1879
McCormick Bldg.
CHICAGO

Eastern Office
Cochran & Wrightson
47 W. 34th Street
New York

MASSACHUSETTS
DAVIDSON PROPELLER
FANS



Are especially suitable for handling large volumes of air at low resistances.

Massachusetts Blower Co.
Watertown, Mass.
Sales Offices in Principal Cities

Detroit's New Residence Heating Ordinance Under Fire.

Although Detroit's new ordinance for the control of residence heating has been adopted by the city council (incidentally over the mayor's veto) its path is not yet cleared of obstacles. Before the ordinance became effective one of the leading heating contractors in Detroit, Harrigan & Reid Company, asked the courts to restrain the city from enforcing the ordinance. The courts thereupon required the city to show cause why it should not be permanently restrained from enforcing this ordinance. The hearing for a permanent injunction was scheduled for August 23 but has been postponed.

Among the features of the new ordinance which have aroused vigorous opposition is the clause requiring that any person installing a heating system in dwellings must have a contractor's license and, as a surety that the rules will be observed, he is required to file a bond in the sum of $1000.

This clause is obviously to indemnify purchasers of defective heating apparatus. Manufacturers of boilers and radiators have fought this practice from the very beginning, realizing that if the City of Detroit adopted such an ordinance, it would be followed by hundreds of ordinances in other cities, each one differing according to the ideas of local officials.

Boiler manufacturers, it is pointed out, can make a boiler ½-in. thick or 2-in. thick, if necessary, so long as that boiler is accepted everywhere, but they cannot make a boiler 2-in. thick for, say, Erie, Pa., 1-in. thick for Des Moines, Ia., and ½-in. thick for Peoria, Ill.

As is well known, the Heating and Piping Contractors' National Association and the National Association of Master Plumbers are officially opposed to legislation of this character. Also the Michigan Chapter of the American Society of Heating and Ventilating Engineers has taken action on the matter and is on record before the Common Council of Detroit as opposed to this kind of regulation of the heating industry.

Trade Literature

VELOCITY STAGE TURBINES, especially designed for high-pressure and high-temperature steam, are described in a 28-page catalogue issued by the De Laval Steam Turbine Co., Trenton, N. J. The turbines are built in sizes up to 1200 H. P. and are designed to be directly coupled to high-speed centrifugal pumps and blowers, small generators and, by means of double helical speed-reducing gears, to large pumps and blowers, medium-size generators, belt pulleys, and slow and moderate speed machinery. Size 8½ x 11 in.

GAS FILTER FOR CO_2 RECORDERS are described in a new bulletin (No. 113) issued by the Uehling Instrument Co., Paterson, N. J. This filter is being marketed under the name of the Pyro-Porus gas filter and is designed to exclude the soot and dirt from the gas-sampling lines. It is placed on the inlet end of the gas-sampling line, inserted in the flue or last pass of the for heaing water in homes and in small furnace. The filter consists of two heavy, for heating water in homes and in small casting by means of a bolt.

AMERICAN-LARSON VENTILATORS are the subject of a new circular issued by the American-Larson Ventilating Co., Pittsburgh, Pa., in which details are given of a recent series of tests conducted by Prof. Trinks of the Carnegie Institute of Technology. The types upon which tests were made were the American-Larson ventilator, a competitive make of the rotary type, and a stationary ventilator of the siphon type. All were of the same throat diameter. The circular quotes the official report of the institute to the effect that a comparison showed the American-Larson as superior to the other types at all wind velocities.

BOOKS ON HEATING AND VENTILATING

MECHANICAL EQUIPMENT OF FEDERAL BULDINGS. By Nelson S. Thompson. Third revised edition, covering the basic data used by the Treasury Department in the design of the entire mechanical equipment of Federal Buildings under its control. Includes data on heating and ventilating, plumbing, drainage and water supply systems, gas piping, conduit, and wiring systems, lighting fixtures, elevators, small power plants, motors and controlling apparatus, vacuum cleaning systems, operating data, etc. Size 6 x 9 in. 400 pages. Cloth $4.00.

PLUMBERS' HANDBOOK. By Samuel E. Dibble. This work contains valuable data for the heating engineer and estimator, architect, building contractor and sheet metal worker, as well as for the plumber. Each subject is treated by a specialist, the section on Pipe Standards and Pipe Dies by F. N. Speller and that on Heating by Alphonse A. Adler. Size 4 x 7 in. 629 pp. 316 ills. Cloth, $4.00.

MECHANICAL EQUIPMENT OF BUILDINGS. Vol. 1. Heating and Ventilation. By Louis A. Harding and Arthur C. Willard. One of the most complete treatises ever published on this subject. Written for the practicing engineer, as well as for the student. Size 7 x 9¼ in., flexible binding. 621 pages and profusely illustrated. Price $6.00.

Vol. II. Power Plants and Refrigeration. An equally complete treatise, illustrating and describing in detail modern power-plant design and refrigerating practice. Size 6¾ x 9¼ in., flexible binding. 766 pages, many illustrations. Price $7.00.

Vol. III. Miscellaneous Building Equipment in preparation, including lighting, elevators, vacuum cleaning, sprinkler systems, plumbing, etc.

HEATING AND VENTILATION. By the late John R. ...len and J. H. Walker. This is the second edition of this work and has been brought up to date in every particular, including the latest radiator transmission factors put out by the Research Laboratory of the A. S. H. & V. E. and the Hill synthetic air chart testing method. Especially adapted for use as a text-book. Size 6 x 9 in. 332 pages. Cloth, $3.50.

STEAM PIPING, ITS ECONOMICAL DESIGN AND CORRECT LAYOUT. By A. Langstaff Johnston, Jr. An analysis of the factors governing the flow of steam in pipes with numerous large curves for use in solving the problems of practical installation and determining the most economical size of pipe for any given set of conditions. Pp. 62. Size 5 x 7½ in. Cloth, $2.00.

PROGRESSIVE FURNACE HEATING. By Alfred G. King. A practical manual of designing, estimating and installing modern systems for heating and ventilating buildings with warm air. Written especially for contractors and mechanics. Size 6 x 9 in. 20 pages. 189 illustrations. Price, $3.00, postpaid.

PIPE FITTING CHARTS. By William G. Snow. A valuable reference work for the solution of knotty problems in connecting up steam radiators, boilers and the variety of appliances used in combination high and low pressure plants. 285 illustrations. Price, $2.00.

STEAM POWER PLANTS: Their Design and Construction. By Henry C. Meyer, Jr., M. E. Third edition, fully revised. One of the standard works on the design and construction of power plants. Covers proportioning boilers, selection and writing specifications for steam engines selection and arrangement of auxiliaries, construction of chimneys coal handling, etc. 219 pages. Size 6 x 9 in. Illustrated with folding plates. Price, $2.00 postpaid.

DESIGNING HEATING AND VENTILATING SYSTEMS. By Charles A. Fuller. A text book which treats both the theoretical and practical side of the subject in a simple, but clear and comprehensive manner. Instruction given covering the design any kind of heating or ventilating system. 224 pages. Size 6 x 9 in. 78 figs. and 37 tables. Cloth, $2.50.

PRACTICAL STEAM AND HOT WATER HEATING. By Alfred G. King. Containing over 300 detailed illustrations. The book is a working manual for heating contractors, journeymen steam fitters, architects and builders. Describes various systems, of heating and ventilation and includes useful data and tables for estimating, installing and testing such systems. 8vo. 367 pages. Price, $3.50.

MECHANICS OF HEATING AND VENTILATING. By Konrad Meier. Including a series of ten charts containing data relating to the flow of water, steam and air, collected by Mr. Meier during an experience of 26 years in heating and ventilating work, both in this country and abroad. Each of the charts replaces a series of tables on the subject, giving at a glance the result of a calculation from any combination of factors. 161 pages, illustrated, with ten large charts. Size 6 x 9 in. Price, $5.00. Separate sets of charts, printed on cloth, with lines in different colors and mounted on boards. Single charts, $1.50. Sets of ten, $15.00.

HEATING AND VENTILATING BUILDINGS, a standard manual for heating engineers and architects. By Prof. R. C. Carpenter. Sixth edition, largely rewritten. 577 pages, 277 illustrations, 8vo, cloth, $3.50.

HANDBOOK FOR HEATING AND VENTILATING ENGINEERS. By James D. Hoffman. Fourth edition of this important work entirely rewritten and reset. A standard manual covering theory and practice, with special chapters on heat losses, furnace heating, water and steam heating, mechanical vacuum heating, mechanical warm-air heating, temperature control, electrical heating and refrigeration. With appendix of 75 tables. Size 4½ x 6¾ in. Pp. 478. Price $4.50 postpaid.

CENTRAL STATION HEATING. By Byron T. Gifford. Second edition. Important new chapters on costs and accounting, replacement and renewal reserve and how to figure it, and economies and design of high-pressure distribution systems are included in the new edition of this work, which presents the most advanced practice in central station heating, both steam and hot water. Central Station Heating is used as a guide in many states of the public utility commissions. 280 pages with 46 illustrations including 40 pages of miscellaneous engineering data. Size 6 x 9½ ins., bound in cloth. Price $4.00.

HANDBOOK OF THE NATIONAL DISTRICT HEATING ASSOCIATION. Devoted to data on all phases of Central Station heating work, including generation, distribution, utilization, meters and water heating, compiled by the Association's Educational Committee. All new and revised data for this book will be supplied free for five years. Bound in leather, with six-ring binder. Price $5.00, postpaid.

The Heating and Ventilating Magazine, 1123 Broadway New York

For Uniform Ventilation Tests According to the Synthetic Air Chart.

A practical remedy for the confusion now existing in the heating and ventilating profession as to what constitutes good ventilation is offered by Dr. E. Vernon Hill in his proposal, made at the recent summer meeting of the American Society of Heating and Ventilating Engineers, that every school board in the United States be urged to write into the specifications of every new school, at least, that a Synthetic Air Chart test be made on every equipment before it is accepted.

It is a fact, as was pointed out by Dr. Hill, that many members of the heating and ventilating profession hold diametrically opposite views with regard to desirable methods of ventilation and show the same wide divergence in practice. This condition, he felt, could not exist if repeated tests were made by the Synthetic Air Chart method of both naturally and mechanically-ventilated school rooms and of the various systems of mechanical ventilation, and the tests studied and carefully compared.

In support of his argument, Dr. Hill presented a series of tests of this kind in the hope, as he expressed it, "that the society will take some definite action in the matter to correlate and standardize practice insofar as this lies in its power."

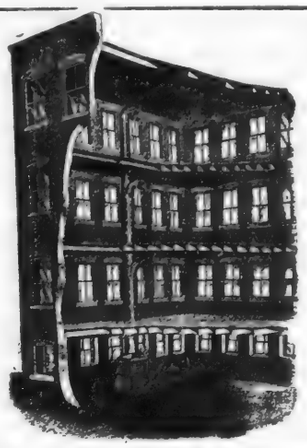
In connection with his presentation Dr. Hill stated that "at the present time all the mysteries regarding ventilation have been removed and the fundamentals are recognized and formally established. This statement is not made as a plausible theory or a working hypothesis, but as an established fact concurred in by all contemporaneous physiologists, or any other authorities on the subject whose experience or standing in the profession entitles their opinion to consideration.

AIR CONDITIONING TRADE MARK

APPARATUS for maintaining artificial atmospheric conditions in industrial plants.

ATMOSPHERIC CONDITIONING CORPORATION

LAFAYETTE BLDG.
PHILADELPHIA

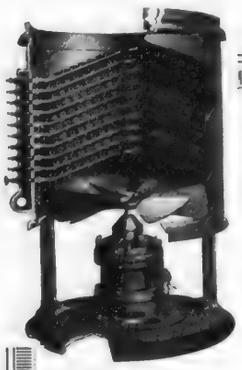


PORBECK INDUSTRIAL AIR HEATER

Adapted for heating and ventilating large buildings. No need of distributing pipes. Takes full advantage of the laws of nature in the production of warmed air and utilizes these laws in providing an even distribution of warmth and comfort throughout the largest of buildings.

Sales representatives wanted

PORBECK MFG. CO.
1000 N. Market St., St. Louis, Mo.



A Convenient Heating Unit

easily installed for either temporary or permanent heating service.

The Bayley B.T.U.

is a complete self-contained heating unit with a heating surface consisting of individual spiral radiator coils one above the other (individually valved if desired). Heat is uniformly distributed by forcing the cooler air along the floor line through these coils by means of an electrically driven fan, thus creating a steady stream of tempered air and producing uniform temperature throughout the room. To install simply set on floor and connect steam and return piping and wiring to motor.

Send for bulletin today.

Bayley Mfg. Co.
Dept. "E"
MILWAUKEE, WISCONSIN

JAMES M. SEYMOUR
Established 1888
Lawrence St., Mechanic St. and Kirk Place
NEWARK NEW JERSEY

PROPELLER TYPE FANS

Many styles for many kinds of service. Low pressure Fans that deliver immense volumes of air at low velocity.

Cone cased Fans for higher pressures, Extreme Fans for high pressure and high velocity.

Compound Fans from 11 feet in diameter to 24 feet in diameter for Mine Ventilation.

Hyatt Roller Bearings. Anti-Friction Metallic wick, self-oiling bearings, and Ball Bearings if the purchaser prefers.

SEYMOUR FANS are not an experiment. Over 100,000 now in service. Built of the best materials. Good Workmanship. Commercially Attractive Prices.

SEND FOR BULLETINS

FLEXIBILITY

—a dominant factor in the choice of a heating or power plant

The ability to adapt furnace action to sudden temperature changes and power demands quickly and easily is an important factor to be considered when specifying power and heating equipment.

More Boiler Power With Less Fuel

In the Twin-Fire Hand Stoker, there is not only extraordinary flexibility, but also exceptional economy of operation, due to twin arches of fire-tile. This exclusive construction means complete combustion of volatile matter and a saving of 10 to 30% fuel.

Twin-Fire
HAND STOKER
"It Burns the Smoke"

Furthermore, the Twin-Fire Hand Stoker does away with a smoke-belching stack and conforms with strictest anti-smoke regulations. Burns all grades of fuel. Installed under low and high pressure boilers ranging from 50 to 1000 H. P.

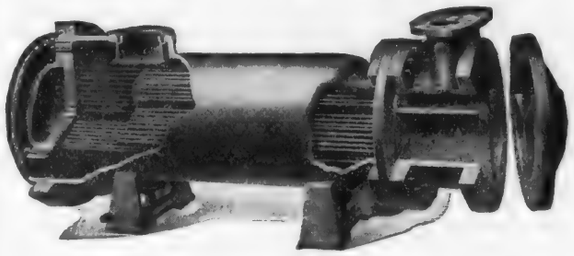
TWIN-FIRE FURNACE CO.
1253 1st. Nat'l Bank Bldg. Chicago, Ill.

"Successful Furnace Builders Since 1898

Get your copy of FREE Book

Tells the "whys" and "Wherefores" of Twin-Fire Operation. Get It

UNLIMITED
Hot Water

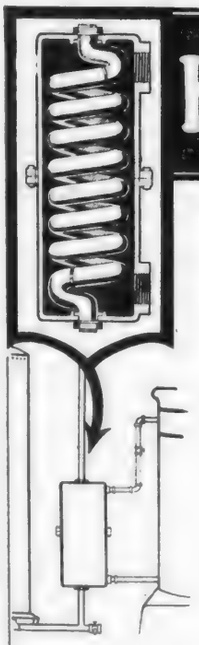


G-R
INSTANTANEOUS HEATER

Uses either live or exhaust steam
Send for Bulletin 231

THE GRISCOM-RUSSELL CO.
2155 West Street Building
EW YORK

Philadelphia	Cleveland	Milwaukee	Charlotte
Boston	Toledo	St. Louis	San Francisco
Hartford	Detroit	New Orleans	Seattle
Syracuse	Chicago	Houston	Kansas City
Pittsburgh	Minneapolis	Fort Worth	Los Angeles
	Rochester	Denver	Salt Lake City



PLENTY OF
HOT WATER
NO EXTRA EXPENSE

The most approved and economical method of heating water for domestic purposes. An abundant supply of hot water at just the right temperature, 24 hours a day, at practically no extra cost. Easily connected to outside of steam, vapor or hot water boiler; does away with fuel-wasting coil in fire pot, uses surplus heat of boiler. Does not overheat or underheat. Will not burn out, once installed.

An unusual opportunity for live dealers. Order now and be prepared for the demand being created. We furnish cooperation and practical sale helps to give you full benefit of our national advertising. Write for full details.

The Hotstream Heater Co.
"Makers of Heaters that Heat"
Cleveland, Ohio

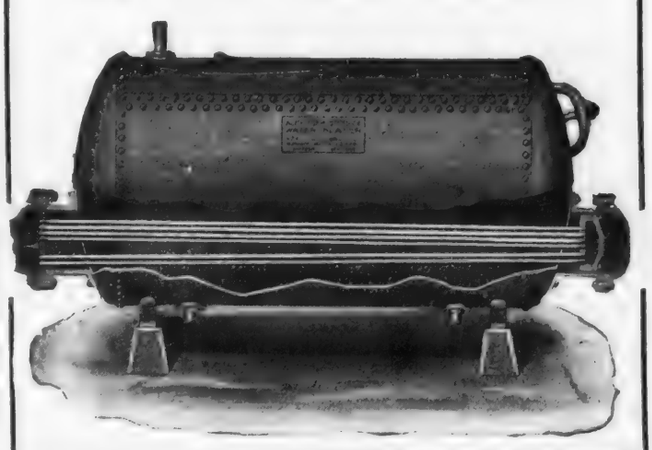
The **Hotstream**
INDIRECT WATER HEATER

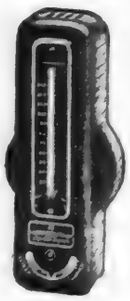
We also make a complete line of Gas and Kerosene Water Heaters.

Reducing Hot Water Costs
WITH
ALBERGER
(Buffalo)
HEATERS

A plentiful hot water supply will always be available at the minimum cost. Let us tell you how it is done.

Alberger Heater Company, Buffalo, N. Y.





The Powers Thermostat—

Built on the vapor disc principle—the heart of the *Powers System of Temperature Regulation*—its sensitiveness to thermal changes is as immutable as the underlying principle of mathematics.

Put in *Powers* and forget it. You will find it just as ready to give accurate service when the heat is turned on in the Fall as it was all the Winter and Spring before.

Cheapest in cost per year—highest in service and satisfaction.

(1768)

It Pays To Be Sure

Therefore, be sure that it is *Powers Regulation* wherever Automatic Heat Control is used.

WHY? Because *Powers Regulation* operates, year after year, requiring no expert adjustment or inspection. It is correct at first and it stays correct—quietly, effectually.

The first cost is usually higher than for other systems—but isn't it worth it?

You are building for your future peace of mind if you insist upon *Powers*—the System famous for continued service.

THE POWERS REGULATOR CO.
Specialists in Automatic Heat Control

2718 Greenview Avenue, Chicago
New York Boston Toronto
Also 28 other Cities. Please consult your Telephone Directory.

BAILEY METERS

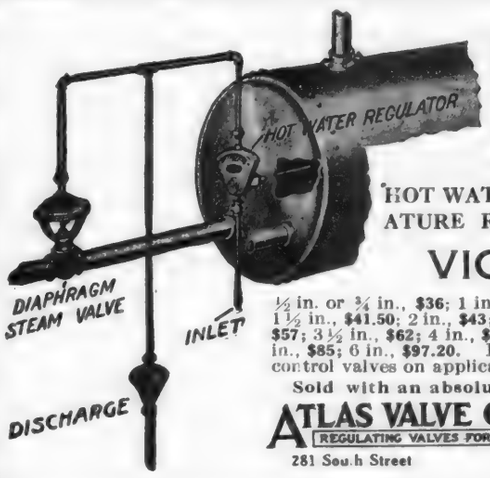
BAILEY FLUID METERS record and totalize the flow of steam at any pressure or temperature, boiler feed, condensate, circulating water, or, practically any fluid flowing in a pipe. These meters are ideal for the measurement of low pressure steam as used for heating, because pressure and temperature records may be included on the same chart, giving the complete story of the steam supply. This makes it possible to calculate the actual B. T. U. supplied to a customer, and is conclusive evidence in case of any question regarding the supply. The pressure compensator has been in service for some little time. This device automatically corrects the totalizer readings for pressure changes, so that actual steam flow may be read directly from the meter.

BAILEY BOILER METERS accomplish more real results toward obtaining maximum efficiency and capacity from boiler operation than all other meters or instruments combined, because they record rate of Steam Flow from the boiler, the Rate of Air Flow through the furnace, and the Flue Gas Temperature on a single uniformly graduated chart. The Steam Flow shows the rate of steam production. The Air Flow shows the amount of air supplied for the support of combustion. The relation between these two records shows an excess or a deficiency of air supplied for the support of combustion. The Flue Gas Temperature is a sure indication of the condition of baffles and heating surface when considered in conjunction with the other records. Wind Box Pressure and Stoker Speed as well as a totalizer for the Steam Flow may be added.

BAILEY WEIR METERS record and totalize flow of water or other liquids through V-Notch weir and are used for feed water, hot well discharge or other fluids at or near atmospheric pressure.

Other Types of Meters as well as Recording and Indicating Gauges are made for different purposes, and nearly any problem in connection with the metering of fluids can be handled. Descriptive Bulletins sent on request.

BAILEY METER COMPANY
2037-E 46th ST. CLEVELAND, OHIO



NET PRICES

HOT WATER TEMPERATURE REGULATOR

VICTOR

½ in. or ¾ in., $36; 1 in., $37; 1¼ in., $40; 1½ in., $41.50; 2 in., $43; 2½ in., $47; 3 in., $57; 3½ in., $62; 4 in., $67; 4½ in., $75; 5 in., $85; 6 in., $97.20. Prices with larger control valves on application.

Sold with an absolute guarantee.

ATLAS VALVE COMPANY
REGULATING VALVES FOR EVERY SERVICE
281 South Street Newark, N. J.

Heating and Ventilation
STANDARD DATA SHEETS

SOME SUBJECTS

B. T. U. Losses	Flow of Steam in Pipes
Ducts and Flues	One Pipe Steam Systems
Chimneys	Vacuum Heating Systems
Fittings	Vapor Heating Systems
Pipe Covering	Gravity Water Heating

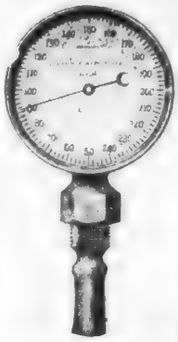
225 Sheets Covering 25 Important Subjects
Price 5 Cents per Sheet

Send for folder giving full list and special prices on sets and folder

HEATING AND VENTILATING MAGAZINE CO.
1123 Broadway, New York City

DEPENDABILITY!

SYNONYMOUS WITH STANDARD "Metallic" THERMOMETERS

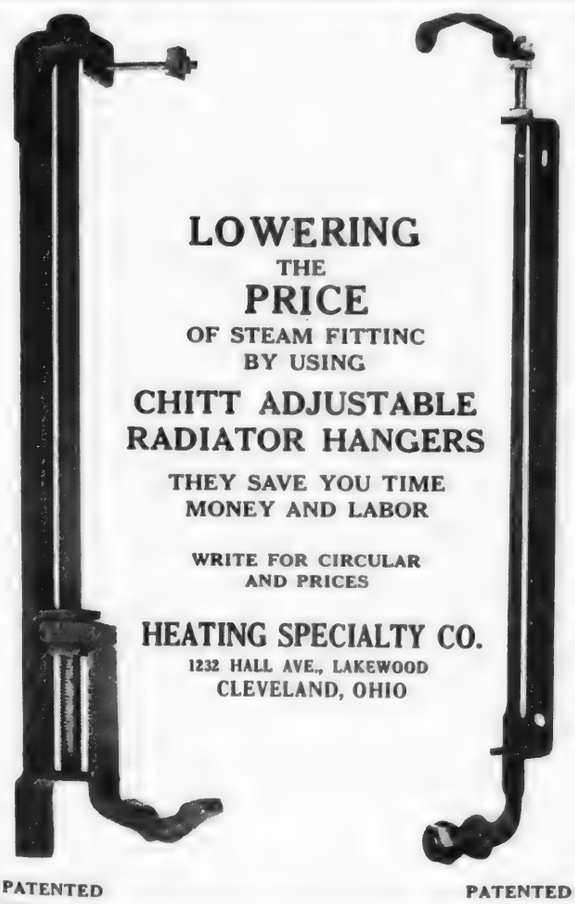


DURABLE
DEPENDABLE
EASY TO READ
PRACTICALLY INDESTRUCTIBLE
SENSITIVE TO CHANGING TEMPERATURES

WARRANTED ACCURATE

Standard "Metallic" Thermometers are built for long and reliable service—backed by our experience of nearly forty years as Thermometer Manufacturers—made in INDICATING or RECORDING type, with ANGLE or STRAIGHT STEM. Write us about your requirements or send for descriptive booklet. We have a variety of sizes and models from which you can select your STANDARD "Metallic" THERMOMETERS.

STANDARD THERMOMETER CO.
Clifton St., Boston 19, Mass.
Nearly Forty Years as Thermometer Manufacturers



LOWERING
THE
PRICE
OF STEAM FITTINC
BY USING
CHITT ADJUSTABLE RADIATOR HANGERS

THEY SAVE YOU TIME
MONEY AND LABOR

WRITE FOR CIRCULAR
AND PRICES

HEATING SPECIALTY CO.
1232 HALL AVE., LAKEWOOD
CLEVELAND, OHIO

PATENTED PATENTED

$5000. Worth of Goods RUINED!

—A Loss that Could Have Been Prevented by

Columbia
Recording Thermometers
With TIME PUNCH

The TIME PUNCH on Columbia Recording Thermometers practically compels the heat tender to maintain an even temperature in heat-treat processes, where wide variations may mean spoilage. For he knows if he doesn't "ring up" at regular intervals that the absence of the punch holes on the chart will tell that he was delinquent.

Side by side with the Time Punch holes on the day-and-night chart runs the line that indicates the temperature. Let that line deviate too much from its proper course and you have positive evidence of deliberate neglect.

Under these conditions you may depend upon it that your operator will exercise more than usual care. The **Time Punch** and the temperature line combined protect you against loss in heat-treat processes as you have never been protected before.

The Time Punch is an exclusive feature found only on Columbia Recording Thermometers, Gauges and Tachometers.

Write today for our interesting booklet H-14

THE Schaeffer & Budenberg Mfg. Co.
AND
American Steam Gauge & Valve
MFG. CO. DIVISION

Atlanta
Baltimore
Boston
Buffalo
Chicago
Detroit
Los Angeles
Philadelphia
Pittsburgh
New Orleans

INSULATION MEANS CONSERVATION

At all times, more especially these times of high coal prices, INSULATION means CONSERVATION of fuel.

Make that exposed hot surface a permanent, high paying investment by insulating it with

BANNER ROCK WOOL JACKET

100% FIREPROOF

HOT SURFACE INSULATION

Adaptable for Temperatures up to 800° F.

BANNER ROCK PRODUCTS COMPANY

ALEXANDRIA **INDIANA**

CHICAGO: 1502 Monadnock Bldg. **ST. LOUIS: 1310 Syndicate Trust Bldg.**

FOR UNDERGROUND STEAM OR HOT WATER PIPES

THE ORIGINAL RIC-WIL METHOD

embodies more original ideas, more advanced engineering, and more good practical features than any other system on the market. The material, construction, installation methods and practical results which, combined, form what we call the RIC-WIL Method, appeal with equal force to the engineer, to the practical operating man and to the business executive. Let us send you a copy of our descriptive Bulletins 1-3. Write to-day.

The RIC-WIL COMPANY CLEVELAND

THE HANGER FOR YOUR NEXT JOB

is the hanger that will fulfill your every demand and that is the

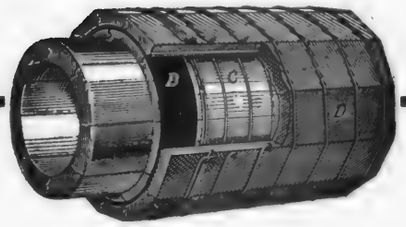
E-Z Radiator Hanger

Suitable for all wall and column radiation, is self-adjusting, is designed for vertical or horizontal alignment and require but one anchor bolt for each hanger. It is also designed to anticipate the use of temperature control valves.

STYLE R

IMMEDIATE SHIPMENT

HEALY-RUFF COMPANY
PLYMOUTH BUILDING
MINNEAPOLIS, MINN.



A—Inner Shell, 2 inches thick.
B—Asphaltum Packing.
C—Dead Air Space.
D—Outer Shell, 1 inch thick.

Cover Your Steam Pipes with

Wyckoff's
Improved
Cypress Covering

Not affected by wet and dry conditions common to steam-pipe trenches. Will not rot. Absolutely water and steam tight. Each shell is wound with extra-heavy steel wire. Coated all over with the best known preservative—**Montezuma Asphalt.**

Write for catalog

A. WYCKOFF & SON CO.
ELMIRA, N. Y.

PYRO-BESTOS

Underground Pipe Insulation

For piping from central heating plants or power stations to detached buildings of Universities, Asylums, Hospitals, Factories, etc. Also an underground Pipe Conduit for heating private Auto Garages direct from House heating systems.

Cannot rot or decay nor will it retain moisture to rust and destroy the piping during non-heating season.

Saves most coal, sends dry steam to a greater distance and by reason of its advanced common sense method of installation is at the same time a lower cost per foot of pipe covered than any other Underground Pipe Insulation on the market.

National Asbestos Mfg. Co.
163-193 Henderson Street, Jersey City, N. J.

This $25,000,000 Yearly Loss is Preventable!

STATISTICS show that about $25,000,000 worth of hot water piping and apparatus corrodes away every year in the United States—a grave and quite unnecessary economic loss.

Exhaustive experiments and practical tests have proven that air dissolved in the water is the primary cause of piping corrosion. Rusting can get in its destructive work, only in the presence of oxygen. Removing the dissolved air from water before it enters the piping extends the life of the metal indefinitely.

A practical method for the removal of air and dissolved gases from water is in successful use. The Elliott Deaeration Process, as the method is called, is simple and unfailing. It is able not only to stop corrosion, but it will gradually clear out the rust from choked pipes. It eliminates rusty water. It extends the life of the piping system to that of the building, itself.

Figure up whether you can afford not to investigate this practical piping insurance, which prevents loss and protects your client's investment.

ELLIOTT COMPANY
Pittsburgh, Pa.

General Sales Office:
Fourth Street, Jeannette, Pa.

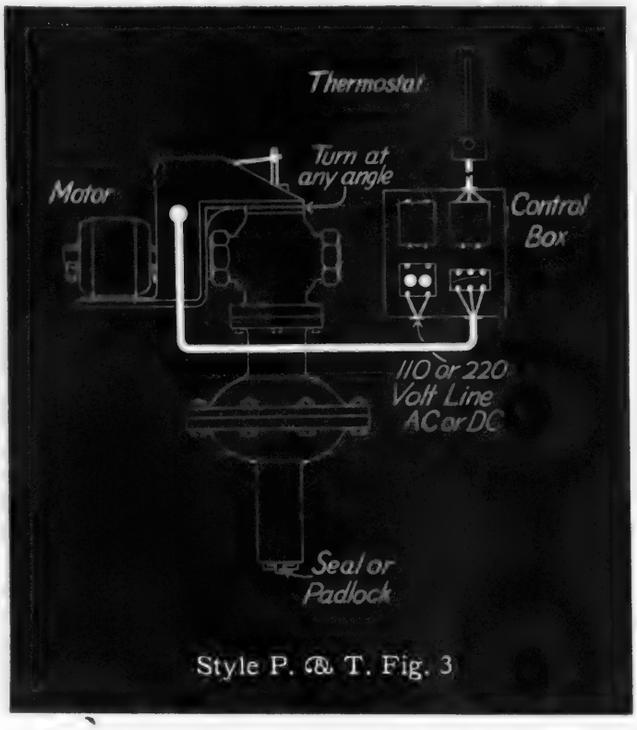
DISTRICT OFFICES:

New York	Cleveland	Kansas City
Chicago	Cincinnati	Pittsburgh
Philadelphia	Detroit	Syracuse
Boston	St. Louis	Atlanta

N-765

ELLIOTT
De-aer-ated water can't rust
Deaerator

HORNUNG PRESSURE and TEMPERATURE CONTROL VALVES



Style P. & T. Fig. 3

MASTER CONTROL

The MASTER CONTROL was designed, and is especially adapted, for control of steam heat as served from a Central Heating Plant.

The MASTER CONTROL is a combination of two valves in one, in which the lower diaphragm operates to control the pressures while the motor mounted on top of the valve operates to close off the steam when no heat is required in the building.

These valves are made interchangeable so that the MOTOR DRIVEN TEMPERATURE CONTROL may be attached to the PRESSURE CONTROL at any time.

The temperature control is also furnished without the pressure control diaphragm.

The MASTER CONTROL valve has been in use for twelve years and the saving it brings to the customer is clearly a matter of record.

A 30% reduction in the meter bill is a conservative average.

CENTRAL HEAT APPLIANCES

343 South Dearborn Street J. C. HORNUNG CHICAGO, ILL.

TRADE JENKINS MARK Jenkins Bros.

A guide to valve satisfaction

Among the world's best known trade marks is the Jenkins "Diamond."

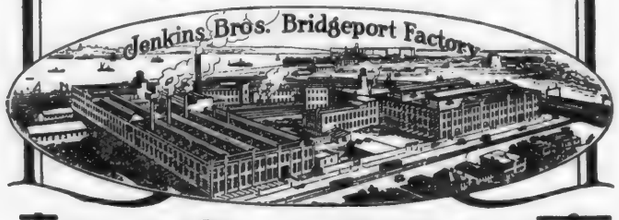
For years and years it has been the buying guide to dependable valve service—the symbol of satisfaction that the man who knows valves and valve requirements insists must be cast on the valves he uses.

Properly designed valves, made with pains-taking care, with strength to stand the most severe of service conditions.

You can get a Jenkins Valve for every service

JENKINS BROS.

New York Boston Philadelphia Chicago
Montreal London



Jenkins Valves
SINCE 1864

CAPITOL PACKLESS QUICK OPENING VALVES

Have opposing seats.

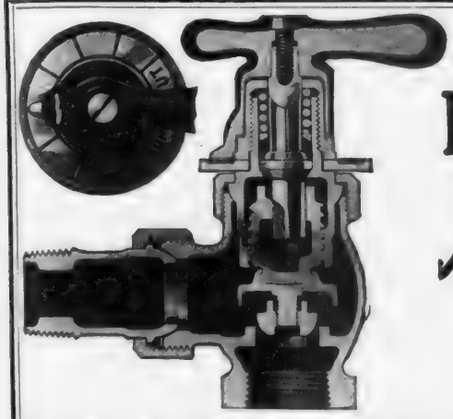
Can be used on either pressure or vacuum systems.

Perfect in every detail.

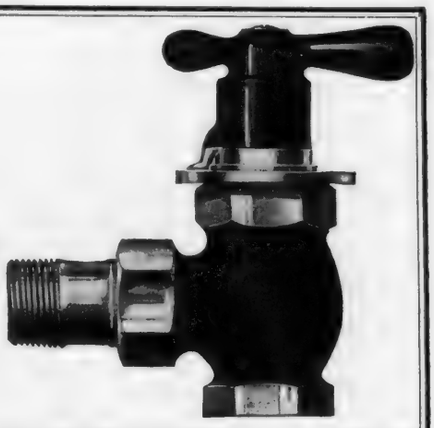
CAPITOL PRODUCTS ALWAYS SATISFY.

Write for catalog and prices.

CAPITOL BRASS WORKS
Detroit, Mich.



MARSH
RE-ENFORCED
MODULATED
VALVES



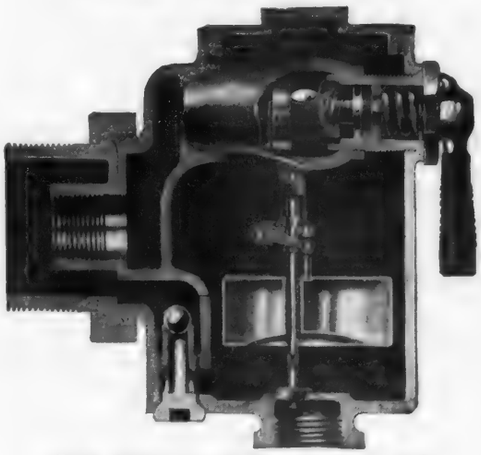
SOMETHING ENTIRELY NEW!

Nothing like it in Modulation valve handle construction, giving the same seating force in closing valve and smoothness of operation as with a wood wheel, completely doing away with side strain and necessity of having to reach over or around valve to operate same.

Catalogues, Lists and Discounts on Application

MARSH VALVE COMPANY, DUNKIRK, N. Y.

IT'S DIFFERENT
Make Us Prove It



Cross Section of the Vacuum, Vapor and Low Pressure Dual Valve.

1. The Dual Valve permits no steam to enter return pipe.
2. Free air exit at all times regardless of the position of return valve.
3. Requires no eccentric or other bushings.
4. The Dual Valve replaces both the ordinary trap and graduated supply valve.
5. The operation is controlled by condensation—a natural element.
6. *The Dual Valve is the absolute elimination of all trap troubles.*

Heating and Power Appliance Company
Milwaukee, Wisconsin

TRADE MARK STERLCO

The Sterling Slide Valve Return Trap

Patent applied for

Will thoroughly drain return lines of heating systems, eliminate air without loss of vapor and return water to the boiler against pressure.

It will lift liquids to a higher level where steam or air pressure is available.

It can be placed as low as 3 inches above the water line of the boiler, thus making it possible to install vapor systems in basements with low ceilings.

A cure for sick Vapor Heating Jobs

STERLING ENGINEERING CO.
419 Third Street MILWAUKEE WISCONSIN

Full Complement of Building Pumping Units

Automatic, Centrifugal, Vacuum and Boiler Feed Pumps

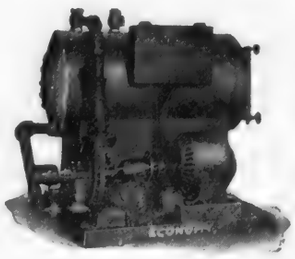
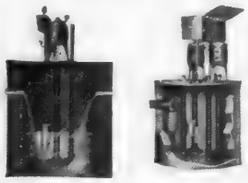


Fig. 2234

Capacities, 2500 to 65000 square feet direct radiation per standard single units.

Self Contained
High Class—Dependable

Cellar Drainers, Bilge and Sump Pumps, Sewage Ejectors



Duplex Single

Capacities, 7 to 3000 gallons per minute.

Duplex Units, Double Capacity

Made in several types and specially designed to meet all conditions.

Automatic Condensation Pumps and Receivers

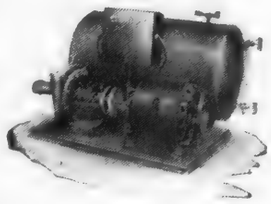
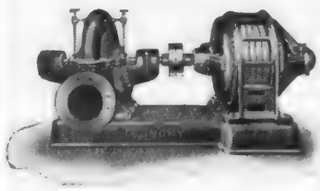


Fig. 2176

Capacities, 1000 to 125000 square feet

Made in following types: Horizontal, Vertical, and Underground. Also Piston types for extreme pressures.

Centrifugal Pumps for all purposes



Made either Single or Multi-stage

Boiler Feed house device. Hot water heating and Ice water circulating pumps.

All capacities and pressure from 5 to 5000 gallons per unit.

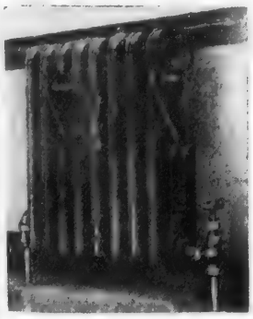
PERFORMANCE GUARANTEES

ECONOMY PUMPING MACHINERY CO.

122-124 N. Curtis St. Chicago, Illinois.

HARTMANN

RADIATOR BRACKETS



WHY ?

LABOR SAVED
NO WALL STRIPS
NO BREAKAGE
NO DIRT
INEXPENSIVE

Send for descriptive circular

CHARLES HARTMANN CO.
Sheet Metal Constructors
985 Dean St., Brooklyn, N.Y.

Ross

Surface Barometric and Jet Condensing Equipments for Power Plants.
Main, Auxiliary, Distilling Condensers & Evaporators for Marine Service.
Distilling Condensers for Refrigeration and Chemical Plants.

"Crosshead Guided" Expansion Joints
Ross Boiler Feed Water Heaters.
Ross Oil and Sugar Juice Heaters.
Gravity & Forced Circulation Heaters.
Ross Oil, Air and Water Coolers.

ROSS HEATER & MFG. CO., Buffalo, N. Y.

THE BRAND THAT LEADING ENGINEERS DEMAND

BARNES & JONES

—THE—

QUALITY PRODUCT

IN

Modulation, Vapor and Vacuum Heating Appliances

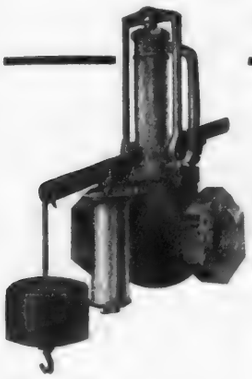
Built on 20 years experience

BARNES & JONES, 5 Melrose St., Boston 11, Mass.

New York Office
Grand Central Terminal

Representatives
Principal Cities

Try a Davis where other regulators fail—



THERE is a pressure regulator every feature of which has been evolved by years of intensive study. Once installed in a heating system, it never reminds you of its presence during an extraordinary long life of carefree, flawless service. This device is the Davis regulator.

Utilizing the positive principle of the simple balanced scale, the Davis Regulator will accurately reduce any high steam pressure to the exact lower pressure required for steam consuming auxiliaries, such as engines, turbines, pumps, and steam using processes. The Davis has no springs or diaphragms and therefore lasts longer and serves better.

Try the Davis Regulator and the other time-tested Davis Specialties listed opposite where other devices have failed—and note the difference!

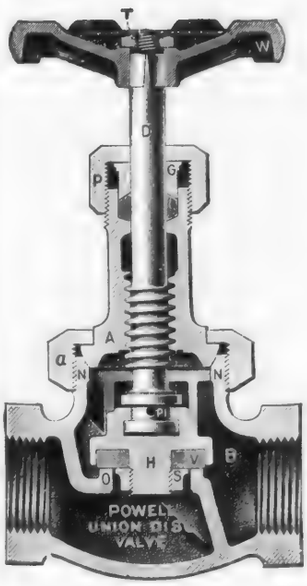
You can get Davis Regulators at the lowered prices listed below; a money-back guarantee goes with each valve. Ask the G. M. Davis Regulator Company, 436 Milwaukee Avenue, Chicago, for complete description.

Ask for description of Davis—

Water Control Valve
Back Pressure Valve
Balanced Valve
Stop and Check Valve
Flow Regulator
Fluid Level Controller
Float Valve
Steam Trap
Relief Valves
Non-Return Valve

DAVIS VALVE SPECIALTIES
STEAM SAVERS SINCE 1875

POWELL VALVES



UNION COMPOSITE DISC VALVES

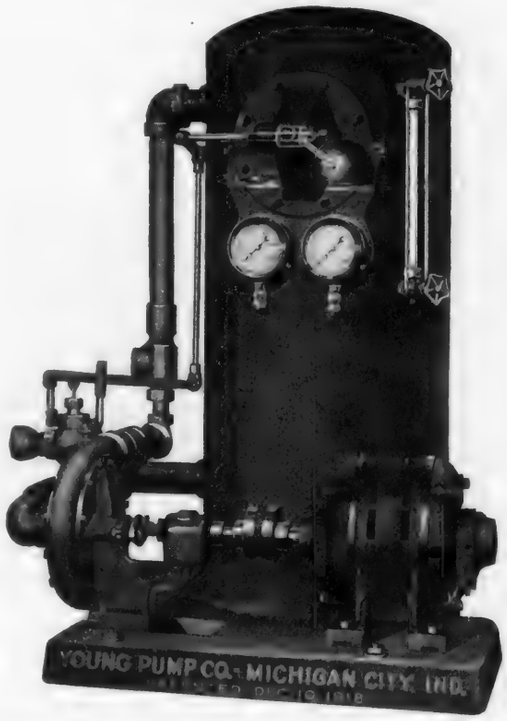
ALWAYS DEPENDABLE

For Hot Water or Steam Heating

Notice the Union Bonnet Connection

Ask your dealer for Powell Valves

The Wm. Powell Company
Cincinnati, Ohio



They Come This Way!

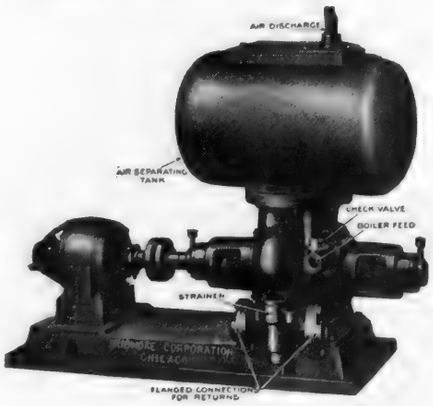
JUST as you see the "YVM" outfit in the above illustration—that is the way the Young Centrifugal Vacuum and Boiler Feed Outfits are shipped. *Complete in every detail!* When received on the job, it is only necessary to make pipe connection to the system and boiler and wire connection to the motor. Then all is ready for operation.

The "YVM" is the simplest outfit made. There are no valves, springs or other parts that require adjustment, wear out or cause repair expense. It has a very low maintenance cost—in fact, the outfit is *economical in every way.*

Made in six sizes to handle 4,000, 8,000, 16,000, 26,000, 40,000 or 65,000 sq. ft. of radiation; for continuous operation or automatic control, to meet any condition or pressure.

Young Pump Company
Michigan City **Indiana**
Chicago Office, 327 S. Lasalle St.

SKIDMORE HYDRO TURBINE VACUUM AND BOILER FEED PUMP



Set Them as They Come

Connect up returns, wire motor and run.
Constant efficiency.
Simple design.
Low power consumption.
Bronze fitted throughout.
Minimum floor space.
Large capacity.
Return connections are close to floor.
No loss of feed water due to over flowing.
Only one moving part.
Shaft carried on heavy ball bearings.
A self contained unit all on one base.
The newest and simplest device for use on a vacuum heating system.
As there are no close clearances, this pump will maintain its original high efficiency indefinitely.

Write for Bulletin No. 1

Built in five sizes for 10 and 20 lbs. pressure, to handle 8000, 16000, 26000, 40000, and 65000 sq. ft. of radiation, for continuous service or with automatic control.

SKIDMORE CORPORATION

General Offices and Factory
1535 Dayton St. CHICAGO, U. S. A.

By Repute "Always" Reliable

Mason Reducing Valves have an extraordinary reputation for three things—long life, continuous service and reliability, which is, after all, only a natural tribute earned through merit.

MASON REDUCING VALVES

are made in many types and sizes, and every type and every size can be depended upon to reduce and maintain pressure at the proper delivery point, regardless of the fluctuation in the initial pressure.

To make your assurance doubly sure, Mason service is never separated from Mason products.

If pressure regulation problems trouble you, make use of our service.

MASON REGULATOR COMPANY

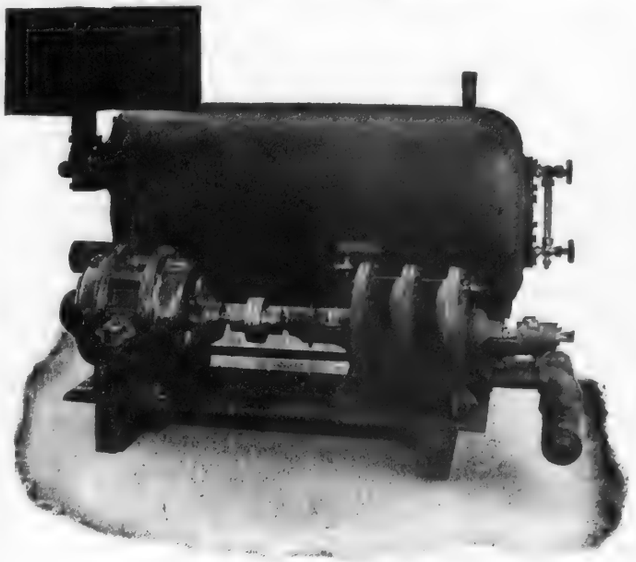
Boston, Mass. San Francisco, Cal. Montreal, Canada

YEOMANS

ELECTRICALLY OPERATED

CONDENSATION RETURN PUMPS

HORIZONTAL AND VERTICAL



SPECIAL TYPE H HIGH PRESSURE UNIT

RUGGED RELIABLE

Constructed to insure long life.
Superiority proven by years of experience.

Send for Bulletin C-5100

YEOMANS BROTHERS CO., 1421 Dayton St., Chicago, Ill.
Canadian Representatives Darling Bros., Ltd., Montreal

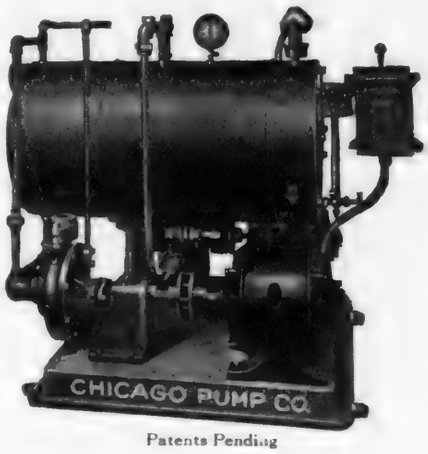
CONDO-VAC RETURN LINE PUMP

CONDENSATION-VACUUM PUMP

A return line vacuum pump, like any other pump, is designed for efficiency and economy. A pump that is wasteful or one that is constantly in need of repair is money and time lost.

Our Condo-Vac return line pump is designed and made of such materials that it will stand up under the most distressing and unusual circumstances as well as under easy operation terms.

True efficiency in a Return Line Vacuum pump can be obtained only with a CONDO-VAC because—air and water are handled by separate pumps, each driven by its own motor and each controlled independently, eliminating the waste in electricity and wear on machinery.



Patents Pending

Each pump operates only when there is actual need of its services.

Since air and vapor are approximately four-fifths of the volume handled, there is no need of running the water pump four-fifths of the time unnecessarily. These are some of the many reasons which makes the CONDO-VAC especially desirable.

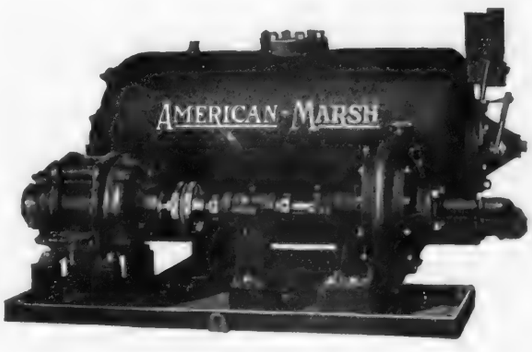
THE ABOVE ADVANTAGES OF THIS PUMP ARE BUT A FEW OF THEM. SEND FOR BULLETIN 45 AND SEE THE OTHER ADVANTAGES FOR YOURSELF.

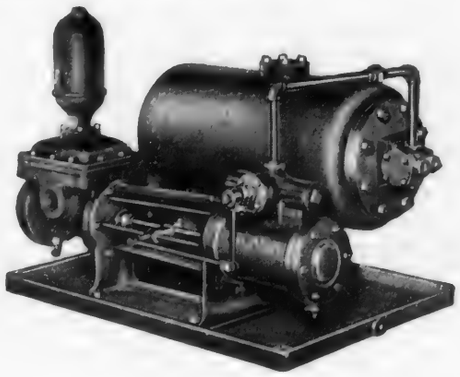
CHICAGO PUMP COMPANY

2325 WOLFRAM STREET CHICAGO, ILLINOIS

American-Marsh Condensation Pumps

Direct Acting and Centrifugal





American-Marsh Condensation Pumps are the result of over thirty-five years experience in the manufacture of high grade pumps for heating systems. They are built in the motor driven centrifugal type in both horizontal and vertical patterns, the vertical type being intended for use where the returns are laid on or under the basement floor.

The steam driven pattern is equipped with the well known American-Marsh steam valve, the same as used on American-Marsh Vacuum Pumps. With this type of valve the pump positively cannot short-stroke or race. Steam pumps can be furnished to operate on steam pressures as low as 10 pounds. On pressures lower than this the motor driven type is recommended.

May we send you our interesting booklet covering pumps for heating systems?

AMERICAN STEAM PUMP COMPANY, Battle Creek, Mich.

ENGINEERS' SPECIFICATION INDEX

AIR COMPRESSORS.
Nash Engineering Co., So. Norwalk, Conn.

AIR CONDITIONING APPARATUS.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corporation, Philadelphia, Pa.
Buckeye Blower Co., Columbus, O.
Carrier Engineering Corporation, Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

AIR COOLING AND DRYING SYSTEMS.
Atmospheric Conditioning Corp., Phila., Pa.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
Cooling Tower, Inc., New York.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

AIR ELIMINATORS.
Jas. P. Marsh & Co., Chicago, Ill.

AIR SEPARATORS.
Griscom-Russell Co., New York.
Hoffman Specialty Co., New York.

AIR WASHERS.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila, Pa.
Buffalo, Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, New York.
Clarage Fan Co., Kalamazoo, Mich.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

AUTOMATIC SPRINKLERS
Grinnell Co., Inc., Providence, R. I.

BLOWERS.
Fan.
American Blower Co., Detroit. Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, Ohio.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Porbeck Mfg. Co., St. Louis, Mo.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

Pressure.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

Rotary.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg Co., New York.

Turbine.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

BOILER BREECHINGS.
Hartmann Co., Charles, Brooklyn, N. Y.

BOILERS.
Copper.
Dahlquist Mfg. Co., Boston, Mass.

Down-Draft.
American Radiator Co., Chicago, Ill.
The Brownell Co., Dayton, O.
Chicago Down Draft Furnace Co., Chicago, Ill.
Hart & Crouse Co., Utica, N. Y.
Herbert Boiler Co., Chicago, Ill.
Illinois Malleable Iron Co.. Chicago, Ill.
Kewanee Boiler Co., Kewanee, Ill.

Heating.
Advance Boiler Corp., New York.
American Radiator Co., Chicago, Ill.
Brownell Co., The, Dayton, O.
Gorton & Lidgerwood Co., New York.
Gurney Heater Mfg. Co., Boston, Mass.
Hart & Crouse Co., Utica, N. Y.
Herbert Boiler Co., Chicago, Ill.
Illinois Malleable Iron Co.. Chicago, Ill.
International Heater Co., Utica, N. Y.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Titusville Iron Works Co., Titusville, Pa.
Utica Heater Co., Utica, N. Y.

Oil Burning
Breese Engineering, Inc., Chicago, Ill.

Power.
Kewanee Boiler Co., Kewanee, Ill.
Oil City Boiler Works, Oil City, Pa.
Titusville Iron Works Co., Titusville, Pa.

CALORIMETERS.
Sarco Co., New York.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.

COILS, PIPE.
Buckeye Blower Co., Columbus, O.
Simmons Co., John, New York.

Air.
New York Blower Co., Chicago, Ill.

COOLERS.
Oil.
Griscom-Russell Co., New York.

CONDENSERS.
Alberger Heater Co., Buffalo, New York.
Alberger Pump & Condenser Co., New York.
American Radiator Co., Chicago, Ill.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Forge Co., Buffalo, N. Y.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

CONVERTERS, HOT WATER.
Patterson-Kelley Co., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

COVERING, PIPE.
America District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
National Asbestos Mfg. Co., Jersey City, N. J.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son Co., A., Elmira, N. Y.

DAMPERS, DUCT.
American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.

DEHUMIDIFYING APPARATUS.
Atmospheric Conditioning Corp., Phila., Pa.
Carrier Engineering Corporation, New York.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

DISTILLERS, (water).
Griscom-Russell Co., New York.

DRYING SYSTEMS.
(See Air Cooling and Drying Systems.)

DUST COLLECTING SYSTEMS.
American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, New York.
Clarage Fan Co., Kalamazoo, Mich.
Hersh Brothers Co., Allentown, Pa.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

DUST COLLECTORS.
Atmospheric Conditioning Corp., Phila., Pa.
Clarage Fan Co., Kalamazoo, Mich.
Hersh Brothers Co., Allentown, Pa.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

DUST DETERMINATORS.
Atmospheric Conditioning Corp., Phila., Pa.

ECONOMIZERS, FUEL.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EQUALIZING LOOPS.
Hoffman Specialty Co., New York.

EXHAUST SYSTEMS.
Buckeye Blower Co., Columbus, O.
Hartmann Co., Charles, Brooklyn, N. Y.

ENGINES.
Steam, Automatic.
American Blower Co., Detroit, Mich.
The Brownell Co., Dayton, O.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Steam, High Speed.
American Blower Co., Detroit, Mich.
Clarage Fan Co., Kalamazoo, Mich.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

EVAPORATORS.
Boiler Feed Make-up.
Griscom-Russell Co., New York.

EXHAUST HEADS.
Burt Mfg. Co., Akron, O.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley, Co., New York.
Simmons, Co., John, New York.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Wright-Austin Co., Detroit, Mich.

EXPANSION JOINTS.
Alberger Heater Co., Buffalo, N. Y.
Alberger Pump & Condenser Co., New York.
American District Steam Co., No. Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Griscom-Russell Co., New York.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Ric-Wil Co., Cleveland, O.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Webster & Co., Warren, Camden, N. J.

FANS, EXHAUST.
American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo, Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

FILTERS, (Aerating).
Griscom-Russell Co., New York.

Feed-water.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.

FITTINGS, FLANGED.
American District Steam Co., No. Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.
Simmons Co., John, New York.

FLANGES.
American District Steam Co., No. Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Jenkins Bros., N. Y.

FUEL OIL BURNERS.
Breese Engineering Inc., Chicago, Ill.
Combustion Co., Chicago, Ill.

FURNACES, WARM AIR.
Twin Fire Furnace Co., Chicago, Ill.

GASKETS, METALLIC.
Sarco Co., New York.

GAUGE BOARDS.
American Steam Gauge & Valve Mfg. Co., Boston, Mass.
Bishop & Babcock Co., Cleveland, O.
McAlear Mfg. Co.. Chicago, Ill.
Jas. P. Marsh & Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
Webster & Co., Warren, Camden, N. J.

GAUGES.
Draft.
American Steam Gauge & Valve Mfg. Co., Brooklyn, N. Y.
Jas. P. Marsh & Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.

Hydraulic.
Jas. P. Marsh & Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.

Ounce Graduated.
Jas. P. Marsh & Co., Chicago, Ill.

Pressure.
American Steam Gauge & Valve Mfg. Co., Brooklyn, N. Y.
American Dist. Steam Co., North Tonawanda, N. Y.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
Webster & Co., Warren, Camden, N. J.

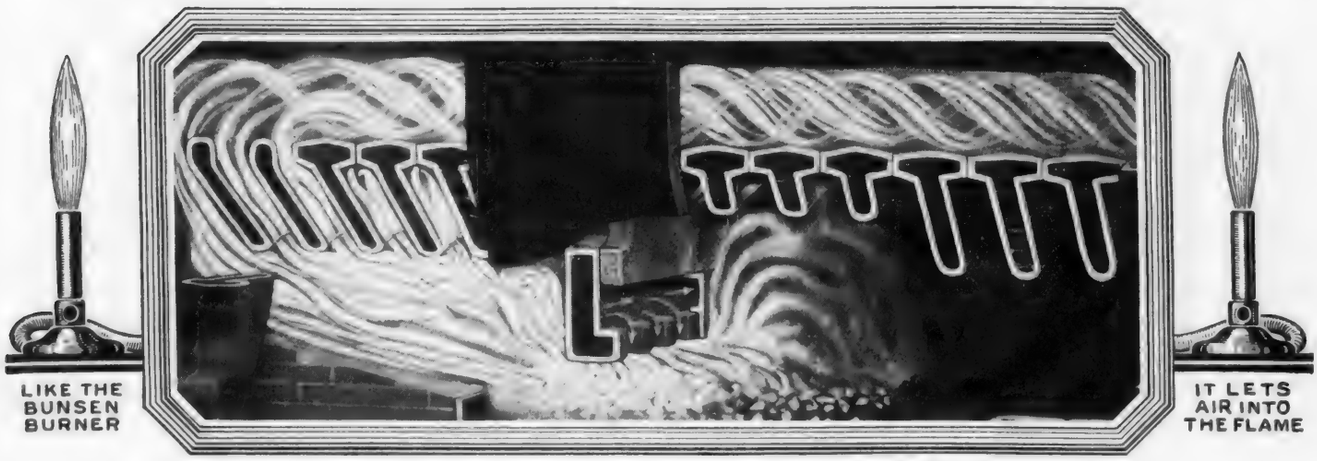
Vacuum.
American Steam Gauge & Valve Mfg., Co., Brooklyn, N. Y.
Bishop & Babcock Co., Cleveland, O.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
Webster & Co., Warren, Camden, N. J.

Water.
American Steam Gauge & Valve Mfg. Co., Brooklyn, N. Y.
American District Steam Co., No. Tonawanda, N. Y.
Capitol Brass Works, Detroit, Mich.
Detroit Lubricator Co., Detroit, Mich.
Jenkins Bros., New York.

GENERATOR COOLING SYSTEMS.
Atmospheric Conditioning Corp., Phila., Pa.
Cooling Tower, Inc., New York.
Sturtevant Co. B. F., Hyde Park, Boston, Mass.

GENERATORS, (Heat)
Honeywell Heating Specialties Co., Wabash, Ind.

GOVERNORS, (pump).
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Wright-Austin Co.. Detroit, Mich.



SUPER-SMOKELESS DOUBLE COMBUSTION CHAMBER AND AIR INTAKE

UTICA-IMPERIAL

Super-Smokeless Boilers

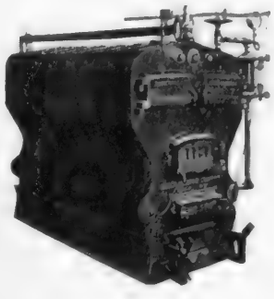
WILL BURN ANY AVAILABLE GRADE OF CHEAP SOFT COAL

YOU'LL find these smokeless boilers in important buildings all over the country, burning soft and hard coal of every grade. They utilize all the fuel, consuming it at a high temperature, neither collecting soot inside nor letting it out in the form of smoke. This means real heating efficiency and fuel economy.

The Bunsen Burner Principle of letting air into the base of the flame accounta for this remarkable combustion. The gases generated from the coal mix with a large volume of air, right at the heart of the fire. The result is an intensely hot, swirling, blue flame that travels twice through the boiler, heating every inch of surface as it goes.

Utica-Imperial SUPER-SMOKELESS Boilers burn any available fuel. Their single grate assures simplicity of operation; and their long firing periods mean a minimum of attention. They are constructed in sections to permit of easy handling, convenience in shipment, and installation in completed buildings.

Recommended by foremost architects
Installed by leading heating contractors
Vouched for by numerous satisfied users



Write for Complete Catalog and List of Installations

UTICA HEATER COMPANY, UTICA, N. Y.

218-220 W. Kinzie St.
Chicago, Ill.

707 Union Building
Cleveland, O.

5620 Grand Central Terminal
New York, N. Y.

Branches in Thirty-one Principal Cities.

ENGINEERS' SPECIFICATION INDEX (Continued)

HEATERS.

(Domestic Water.)

Alberger Heater Co., Buffalo, N. Y.
American District Steam Co., No. Tonawanda, N. Y.
American Radiator Co., Chicago, Ill.
Dahlquist Mfg. Co., Boston, Mass.
Excelso Specialty Works, Buffalo, N. Y.
Grinnell Co., Inc., Providence, R. I.
Griscom-Russell Co., New York.
Hotstream Heater Co., Cleveland, Ohio.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Sims Co., Erie, Pa.
Whitlock Coil Pipe Co., Hartford, Conn.

Feed Water, (Closed).

Alberger Heater Co., Buffalo, N. Y.
Alberger Pump & Condenser Co., New York.
Griscom-Russell Co., New York.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Ross Heater & Mfg. Co., Buffalo, N. Y.
Simmons Co., John, New York.
Sims Co., Erie, Pa.
Whitlock Coil Pipe Co., Hartford, Can.

Feed Water, (Open).

Griscom-Russell Co., New York.
Sims Co., Erie, Pa.
Webster & Co., Warren. Camden, N. J.

Fuel-oil.

Griscom-Russell Co., New York.
American Blower Co., Detroit, Michigan.

Pipe, Coil (Air).

American Blower Co., Detroit, Mich.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

Portable Unit Air.

American Blower Co., Detroit, Mich.
Autovent Fan & Blower Co., Chicago, Ill.
Ilg Electric Ventilating Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

HEATING SYSTEMS.

Gravity and Forced Circulation, Water.
Alberger Heater Co., Buffalo, N. Y.

Vacuum.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, O.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Jas. P. Marsh & Co., Chicago, Ill.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

Vapor.

American District Steam Co., No. Tonawanda, N. Y.
Barnes & Jones, Boston, Mass.
Dunham Co., C. A., Chicago, Ill.
Haines & Co., Wm. S., Philadelphia, Pa.
Illinois Engineering Co., Chicago, Ill.
Illinois Malleable Iron Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Mouat-Squires Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

HUMIDIFIERS.

American Blower Co., Detroit, Mich.
American Moistening Co., Boston, Mass.
Atmospheric Conditioning Corp., Phila., Pa.
Carrier Engineering Corporation, Newark, N. J.
Grinnell Co., Inc., Providence, R. I.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

HUMIDITY CONTROL.

Atlas Valve Co., Newark, N. J.
American Blower Co., Detroit. Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Carrier Engineering Corporation, New York.
W. L. Fleisher Co., New York, N. Y.
Grinnell Co., Inc., Providence. R. I.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F. Hyde Park, Boston, Mass.

HYDROMETERS.

Jas. P. Marsh & Co., Chicago, Ill.

INSTRUMENTS.

Electric Measuring.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Indicating and Recording.

Bailey Meter Co., Cleveland, O.
Hill E. Vernon Co., Chicago, Ill.
Jas. P. Marsh & Co., Chicago, Ill.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.
Sarco Co., New York.
Standard Thermometer Co., Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

INSULATING MATERIALS.

American District Steam Co., No. Tonawanda, N. Y.
Banner Rock Products Co., Alexandria, Ind.
Hornung, J. C., Chicago, Ill.
National Asbestos Mfg. Co., Jersey City, N. J.
Ric-Wil Co., Cleveland, O.
Wyckoff & Sons, A., Elmira, N. Y.

MANOMETERS.

Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.

MECHANICAL DRAFT APPARATUS.

American Blower Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Clarage Fan Co., Kalamazoo, Mich.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Co., New York.

METERS.

Condensation.

American Dist. Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.

Feed Water.

Simmons Co., John, 110 Center St., New York.

Feed Water (Wier Type).

Webster & Co., Warren, Camden, N. J.

Pitot Tube.

American Blower Co., Detroit, Mich.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y.

Steam.

American District Steam Co., No. Tonawanda, N. Y.
Bailey Meter Co., Cleveland, O.

MOTORS, (Electric).

Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

PAINT, FOR HEATED SURFACES.

Ric-Wil Co., Cleveland, O.

PIPE.

Soil.

Simmons Co., John, 110 Center St., New York.

Steel.

Simmons Co., John, 110 Center St., New York.

Wrought Iron

Simmons Co., John, 110 Center St., New York.

Wood.

Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE BENDING.

Buffalo Forge Co., Buffalo, N. Y.
Crane Co., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.
Simmons Co., John, 110 Center St., New York.
Whitlock Coil Pipe Co., Hartford, Conn.

PIPE CASING, WOOD.

American District Steam Co., No. Tonawanda, N. Y.
Wyckoff & Sons Co., A., Elmira, N. Y.

PIPE HANGERS.

Grinnell Co., Inc., Providence, R. I.
Jenkins Bros., New York.
Simmons Co., John, New York.

PIPE CUTTING AND THREADING MACHINES.

Crane Co., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.

PIPE, POWER.

Crane Co., Chicago, Ill.
Grinnell Co., Inc., Providence, R. I.
Simmons Co., John, New York.

POWER PLANT SUPPLIES.

American District Steam Co., No. Tonawanda, N. Y.
Crane Co., Chicago, Ill.
Elliott Co., Jeanette, Pa.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Simmons Co., John, New York.

PUMPS.

Centrifugal.

Alberger Pump & Condenser Co., New York.
American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Sprague Electric Works, New York.
Yeomans Bros. Co., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

Condensation.

American Steam Pump Co., Battle Creek, Mich.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Thompson Mfg. Co., Des Moines, Ia.
Trane Co., La Crosse, Wis.
Western Engineering Co., Davenport, Iowa.
Wright-Austin Co., Detroit, Mich.
Yeomans Bros. Co., Chicago, Ill.

Rotary.

Nash Engineering Co., So. Norwalk, Conn.
Thompson Mfg. Co., Des Moines, Ia.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

Steam.

American Steam Pump Co., Battle Creek, Mich.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.

Turbine.

Alberger Pump & Condenser Co., New York.
Buffalo Steam Pump Co., Buffalo, N. Y.
Nash Engineering Co., So. Norwalk, Conn.
Yeomans Bros., Chicago, Ill.

Vacuum.

American Steam Pump Co., Battle Creek, Mich.
Bishop & Babcock Co., Cleveland, O.
Buffalo Steam Pump Co., Buffalo, N. Y.
Chicago Pump Co., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
Elliott Co., Jeanette, Pa.
Hydro-High Vacuum Pump Co., Newport, Ky.
McAlear Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
Skidmore Corp., Chicago, Ill.
Trane Co., La Crosse, Wis.
Union Steam Pump Co., Battle Creek, Mich.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Yeomans Bros., Chicago, Ill.
Young Pump Co., Michigan City, Ind.

PYROMETERS.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

RADIATOR HANGERS.

Gloeckle, Jr., A. F., Rochester, N. Y.
Hartmann Co., Chas., Brooklyn, N. Y.
Heating Specialty Co., Cleveland, O.
Healy-Ruff Co., Minneapolis, Minn.

RADIATORS, STEAM AND WATER.

American Radiator Co., Chicago, Ill.
International Heater Co., Utica, N. Y.
Gurney Heater Mfg. Co., Boston, Mass.
Simmons Co., John, New York.

RECEIVERS.

Air.

American District Steam Co., No. Tonawanda, N. Y.
The Brownell Co., Dayton, O.
Sterling Engineering Co., Milwaukee, Wis.

Condensation.

Chicago Pump Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Economy Pumping Machinery Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Yeomans Bros., Chicago, Ill.

REGULATORS.

Boiler-Feed.

McAlear Mfg. Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Wright-Austin Co., Detroit, Mich.

Damper.

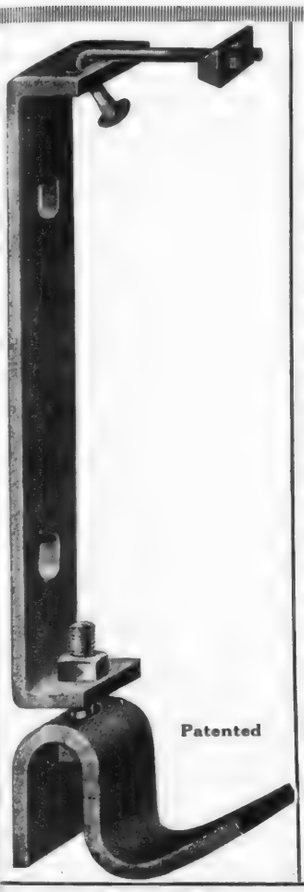
American Dist. Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
American Radiator Co., Chicago, Ill.
Bishop & Babcock Co., Cleveland, O.
Davis Regulator Co., G. M., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
H. Mueller Mfg. Co., Decatur, Ill.
National Regulator Co., Chicago, Ill.
H. W. Nelson Co., Moline, Ill.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
L. J. Wing Mfg. Co., New York.

Pressure.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
McAlear Mfg., Chicago, Ill.
National Regulator Co., Chicago, Ill.

Temperature.

American Radiator Co., Chicago, Ill.
Atlas Valve Co., Newark, N. J.



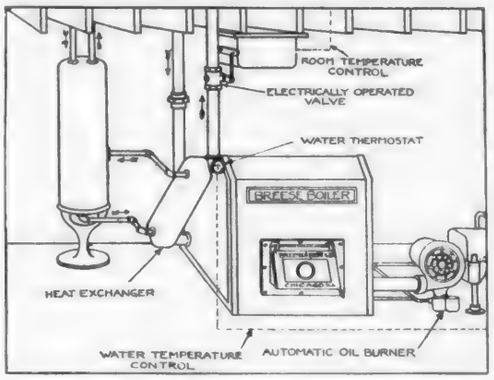
NOTICE!

A. F. Gleockle, Jr.
415 Bay St.
ROCHESTER, N. Y.

manufactures a wall radiator bracket that meets all the requirements of a wall radiator bracket and then some. The "Gleockle" bracket is of Universal adjustment, can be easily erected and fits any make of wall radiator. Made of wrought iron and dipped to prevent rusting, it is indestructible. When the question of wall radiator brackets comes up, remember that "Gleockle" is the answer.

Specifying "Gleockle" Brackets is one way of saving your client money

OIL BURNING BOILERS



FOR HOUSE HEATING

BREESE ENGINEERING INC.

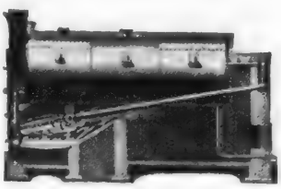
112 West Adams St., Chicago, Ill.

Manufacturers of

Breese Oil Burning Boilers and Automatic Hot Water Supply

SMOKELESS AND COAL SAVING

DOWN DRAFT FURNACES



Designed and manufactured for any make of Water Tube, Scotch Marine or Return Tubular Boilers, for high or low pressure they can be attached to old or new boilers, by any Steam Fitter or Boiler Maker, from information given on Drawings furnished by us.

With our 30 years' experience in this line, we can guarantee proper design and workmanship.

Write for further information

CHICAGO DOWN DRAFT FURNACE CO.

115-117 So. Clinton St. **CHICAGO, ILL.**

Manufacturers of the Improved Chicago Hawley Down Draft Furnaces

SOME SUBJECTS

B. T. U. Losses
Chimneys
Ducts and Flues
Fittings
Flow of Steam in Pipes
One Pipe Steam Systems
Vacuum Heating Systems
Vapor Heating Systems
Gravity Water Heating

Heating and Ventilation

STANDARD DATA SHEETS

222 Sheets Covering 25 Important Subjects
Price 5 Cents per Sheet

Send for folder giving full list and special prices on sets and binder.

HEATING AND VENTILATING MAGAZINE CO.
112³ Broadway **New York City**

GURNEY BOILERS RADIATORS

FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER

GURNEY HEATER MANUFACTURING CO.

HEAD OFFICE FORT HILL SQUARE BOSTON, MASS. **SHOWROOMS NEW YORK-PHILADELPHIA**

ENGINEERS' SPECIFICATION INDEX (Continued)

Bishop & Babcock Co., Cleveland, O.
Carrier Engineering Corporation, Newark, N. J.
Elliott Co., Jeanette, Pa.
Hornung, J. C., Chicago, Ill.
Johnson Service Co., Milwaukee, Wis.
McAlear Mfg. Co., Chicago, Ill.
National Regulator Co., Chicago, Ill.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

SEPARATORS.

OIL.

Burt Mfg. Co., Akron, Ohio.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Wright-Austin Co., Detroit, Mich.

STEAM.

American District Steam Co., No. Tonawanda, N. Y.
Bishop & Babcock Co., Cleveland, O.
Crane Co., Chicago, Ill.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sims Co., Erie, Pa.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

SHEET METAL CONSTRUCTION.

Hartmann Co., Charles, Brooklyn, N. Y.

SPRAY COOLING SYSTEMS.

Atmospheric Conditioning Corp., Phila., Pa.
Cooling Tower Co., Inc., New York
Massachusetts Blower Co., Watertown, Mass.
Seymour, Jas. M., Newark, N. J.

STRAINERS.

OIL

Burt Mfg. Co., Akron, Ohio.
Elliott Co., Jeanette, Pa.
Griscom-Russell Co., New York.

STEAM.

American Dist. Steam Co., No. Tonawanda, N. Y.
Elliott Co., Jeanette, Pa.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., New York.
Wright-Austin Co., Detroit, Mich.

THERMOMETERS.

(Recording and Indicating.)

American Steam Gauge & Valve Mfg. Co., Brooklyn, N. Y.
Sarco Co., New York.
Schaeffer & Budenberg Mfg. Co., Brooklyn, N. Y
Standard Thermometer Co., Boston, Mass.

WATER.

Marsh & Co., Jas. P., Chicago, Ill.

THERMOSTATS.

American Radiator Co,. Chicago, Ill.
Atlas Valve Co., Newark, N. J.
Bishop & Babcock Co., Cleveland, O.
Johnson Service Co., Milwaukee, Wis.
Powers Regulator Co., Chicago, Ill.
Sarco Co., New York.

TRAPS.

RADIATOR.

Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, O.
Dole Valve Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Heating & Power Appliance Co. Milwaukee, Wis.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
Mouat-Squires Co., Cleveland, O.
H. W. Nelson Co., Moline, Ill.
O-E Specialty Co., Milwaukee, Wis.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.

RETURN.

American Blower Co., Detroit, Mich.
Dunham Co., C. A., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jas. P. Marsh & Co., Chicago, Ill.
Mouat-Squires Co., Cleveland, O.
Simplex Heating Specialty Co., Inc., Lynchburg, Va.
Sterling Engineering Co., Milwaukee, Wis.
Trane Co., La Crosse, Wis.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

STEAM.

American Blower Co., Detroit, Mich.
American District Steam Co., No. Tonawanda, N. Y.
American Steam Gauge & Valve Mfg. Co. Brooklyn, N. Y.
Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Elliott Co., Jeanette, Pa.
Haines & Co., Wm. S., Philadelphia, Pa.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Patterson-Kelley Co., New York.
Sarco Co., New York.
Simmons Co., John, New York.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Trane Co., La Crosse Wis.
Wright-Austin Co., Detroit, Mich.

VACUUM.

American Blower Co., Detroit, Mich.
Bishop & Babcock Co., Cleveland, O.
Dunham Co., C. A., Chicago, Ill.
Heating & Power Appliance Co., Milwaukee, Wis.
Hoffman Specialty Co., New York.
Illinois Engineering Co., Chicago, Ill.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Sarco Co., New York.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.
Wright-Austin Co., Detroit, Mich.

TURBINES, (Steam).

Buffalo Forge Co., Buffalo, N. Y.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
L. J. Wing Mfg. Co., New York.

TURBO-BLOWERS.

Westinghoue Electric & Mfg. Co., East Pittsburgh, Pa.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

UNDERGROUND PIPE CONDUITS.

American District Steam Co., No. Tonawanda, N. Y.
Hornung, J. C., Chicago, Ill.
National Asbestos Mfg. Co., Jersey City, N. J.
Ric-Wil Co., Cleveland, O.
Wyckoff & Son., A., Elmira, N. Y.

VACUUM CLEANING APPARATUS.

American Radiator Co., Chicago, Ill.
Spencer Turbine Co., Hartford, Conn.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.

VALVES.

AIR (Automatic)

American Radiator Co., Chicago, Ill.
Commonwealth Brass Corporation, Detroit, Mich.
Dole Valve Co., Chicago, Ill.
Wm. S. Haines & Co., Philadelphia, Pa.
Jenkins Bros., New York.
Marsh & Co., Jas. P., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.
Hoffman Specialty Co., New York.
Russell, W. A. Co., New York.
Simmons Co., John, New York.

AIR RELIEF.

American District Steam Co., No. Tonawanda, N. Y.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
The Wm. Powell Co., Cincinnati, O.
Sterling Engineering Co., Milwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

BACK PRESSURE.

Crane Co., Chicago, Ill.
Griscom-Russell Co., New York.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
Simmons Co., John, New York.

BALANCED.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
McAlear Mfg. Co., Chicago, Ill.

BLOW-OFF.

Crane Co., Chicago, Ill.
Elliott Co., Jeanette, Pa.
Jenkins Bros., New York.
The Wm. Powell Co., Cincinnati, O.
Simmons Co., John, New York.

CHECK.

Crane Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg Co., Elmira, N. Y.
The Wm. Powell Co., Cincinnati, O.
Simmons Co., John, New York.

GATE.

American District Steam Co., No. Tonawanda, N. Y.
Capital Brass Works, Detroit, Mich.
Crane Co., Chicago, Ill.
Dole Valve Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
The Wm. Powell Co., Cincinnati, O.
Simmons Co., John, New York.

GLOBE, ANGLE AND CROSS.

Commonwealth Brass Corp., Detroit, Mich.
Crane Co., Chicago, Ill.
Dole Valve Co., Chicago, Ill.
Illinois Engineeringe Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
Marsh Valve Co., Erie, Pa.
The Wm. Powell Co., Cincinnati, O.
Simmons Co., John, New York.

HYDRAULIC-OPERATING.

Atlas Valve Co., Newark, N. J.
Crane Co., Chicago, Ill.

NON-RETURN.

Crane Co., Chicago, Ill.
Davis Regulator Co., G. M., Chicago, Ill.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
The Wm. Powell Co., Cincinnati, O.
Simmons Co., John, New York.

RADIATOR.

American Radiator Co., Chicago, Ill.
American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Barnes & Jones, Boston, Mass.
Bishop & Babcock Co., Cleveland, O.
Capitol Brass Works, Detroit, Mich.
Commonwealth Brass Corporation, Detroit, Mich.
Crane Co., Chicago, Ill.
Detroit Lubricator Co., Detroit, Mich.
Dole Valve Co., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Gorton & Lidgerwood Co., New York.
Heating & Power Appliance Co., Milwaukee, Wis.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Marsh Co., Jas. P., Chicago, Ill.
Marsh Valve Co., Dunkirk, N. Y.
The Wm. Powell Co., Cincinnati, O.
Trane Co., La Crosse, Wis.
Simmons Co., John, New York.
Simplex Heating Specialty Co., Inc., Lynchburg, Pa.
Sterling Engineering Co., Wilwaukee, Wis.
Webster & Co., Warren, Camden, N. J.

REDUCING.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Davis Regulator Co., G. M., Chicago, Ill.
Dunham Co., C. A., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
Johnson Service Co., Milwaukee, Wis.
Kennedy Valve Mfg. Co., Elmira, N. Y.
McAlear Mfg. Co., Chicago, Ill.
Mason Regulator Co., Boston, Mass.
The Wm. Powell Co., Cincinnati, O.
Powers Regulator Co., Chicago, Ill.

REGULATING.

American District Steam Co., No. Tonawanda, N. Y.
Atlas Valve Co., Newark, N. J.
Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Jenkins Bros., New York.
McAlear Mfg. Co., Chicago, Ill.
The Wm. Powell Co., Cincinnati, O.

SAFETY.

American District Steam Co., No. Tonawanda, N. Y.
Jenkins Bros., New York.
The Wm. Powell Co., Cincinnati, O.

STOP AND CHECK (See Valves, Non-Return.)

VENTILATING HEATERS.

American Blower Co., Detroit, Mich.
American Radiator Co., Chicago, Ill.
Bayley Mfg. Co., Milwaukee, Wis.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Clarage Fan Co., Kalamazoo, Mich.
Hersh Bros. Co., Allentown, Pa.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
Massachusetts Blower Co., Watertown, Mass.

VENTILATING SYSTEMS.

American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corp., Phila., Pa.
Autovent Fan & Blower Co., Chicago, Ill.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Carrier Engineering Corporation, Newark, N. J.
Clarage Fan Co., Kalamazoo, Mich.
W. L. Fleisher Co., New York, N. Y.
Garden City Fan Co., Chicago, Ill.
Hersh Bros. Co., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
H. W. Nelson Co., Moline, Ill.
New York Blower Co., Chicago, Ill.
Peerless Unit Ventilating Co., New York.
Porbeck Mfg. Co., St. Louis, Mo.
Seymour, Jas. M., Newark, N. J.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sprague Electric Works, New York.
Sturtevant Co., B. F. Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

VENTILATORS.

Allen Air-Turbine Ventilator Co., Detroit, Mich.
Buckeye Blower Co., Columbus, O.
Buffalo Forge Co., Buffalo, N. Y.
Burt Mfg. Co., Akron, Ohio.
Hersh Bros. Co., Allentown, Pa.
New York Blower Co., Chicago, Ill.
Seymour, Jas. M., Newark, N. J.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

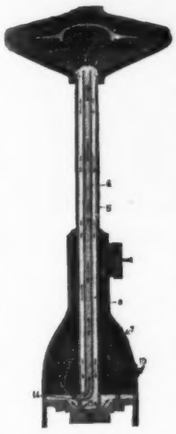
MUSHROOM.

Hersh Brothers Co., Allentown, Pa.
Knowles Mushroom Ventilator Co., New York.
New York Blower Co., Chicago, Ill.

PORTABLE UNIT FANS.

(See Heater Portable Unit Air)

The Honeywell Heat Generator



is the heart of the Honeywell Hot Water Heating System, giving absolute control together with a range of temperature from 85 to 240°. Compare this remarkable flexibility with the 212° to 220° of a good steam system or the 150° to 212° of a good vapor system.

The universal success, the never disappointing years of operation of the HONEYWELL SYSTEM have proved conclusively that the theory upon which it is based is correct. An increased and positive circulation; an instantaneous heat under perfect control, quickly increased or checked; the use of smaller valves and piping, with less water to move; the sending of even heat into radiators at extreme distance from boiler; minimum amount of piping; an easy layout for the fitter and the minimum cost of installation and operation.

Tank-in-attic or Tank-in-basement layouts as desired.

Years of use and thousands installed in the United States, Canada and other countries have proved its superiority.

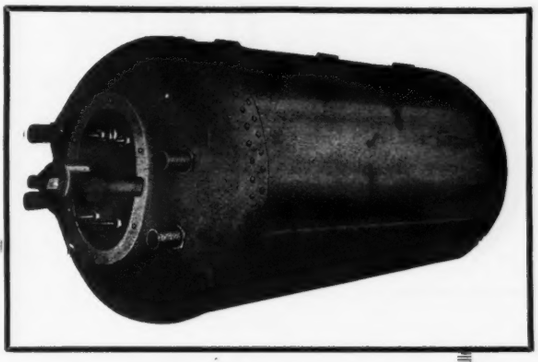
Helpful Engineering Service supplied.

Our booklet "How to Properly Design and Install the Honeywell Method of Hot Water Heating" tells the whole story and will be mailed on request.

The Honeywell Heating Specialty Co.

WABASH, INDIANA

Manufactured in Montreal for Canadian Trade



For Durability
For Service
For Economy

For Personal and Client Satisfaction

SPECIFY

Dahlquist Copper Boilers

Dahlquist Manufacturing Company
40 West 3rd St. Boston, Mass.

Carrier Engineering Corporation

Carrier AIR CONDITIONING AND DRYING EQUIPMENT

750 Frelinghuysen Ave.
NEWARK, N. J.
New York
Boston Philadelphia
Buffalo Chicago

Carrier AIR CONDITIONING AND DRYING EQUIPMENT

Air Conditioning and Drying

Humidification Dehumidification Cooling
Heating Ventilation Purification

High Temperature Air Heaters for
Drying Processing Baking
up to 1000° F.

We invite correspondence

Make "Every day a *good* day" with
MANUFACTURED WEATHER

Peerless Engineering Co.

Lock Box 859, Cincinnati, Ohio
Hydraulic Mechanical Electrical
ENGINEERS
HEATING VENTILATION
Designs, Specifications
Water Power, Water Supply
Suburban Lighting and Power

Surveying or Layouts, Grading and Leveling Up, Foundations, Retaining Walls, Millwrighting, Water Power, Water Supply, Piping all kinds, Bridges, Steel, Reinforced Concrete Tanks, Tanks and Towers, Arches, Garages, Silos, Warehouses, Factory Buildings, Farm Buildings.

GURNEY BOILERS RADIATORS

FOR HEATING ANY DESCRIPTION OF BUILDING BY STEAM OR HOT WATER

GURNEY HEATER MANUFACTURING CO.

HEAD OFFICE FORT HILL SQUARE BOSTON, MASS. SHOWROOMS NEW YORK-PHILADELPHIA

ADVERTISERS' INDEX

Advance Boiler Corp. 9
Alberger Heater Co. 89
Alberger Pump & Condenser Co. 12
Allen Air-Turbine Ventilator Co.... 29
American Blower Co. 77
American District Steam Co. 28
American Radiator Co. 67
American Steam Gauge & Valve Mfg. Co. 26
American Steam Pump Co. 99
Atlas Valve Co. 90
Atmospheric Conditioning Corp. 88
Autovent Fan & Blower Co..... 73

Bailey Meter Co. 90
Banner Rock Products Co. 92
Barnes & Jones 96
Bayley Mfg. Co. 88
Bishop & Babcock Co. 27
Breese Engineering, Inc. 103
Brownell Co. 6
Buckeye Blower Co. 81
Buffalo Forge Co. 75
Burt Mfg. Co. 80

Capitol Brass Works 94
Carrier Engineering Corp. 105
Chicago Down Draft Furnace Co. 103
Chicago Pump Co. 99
Clarage Fan Co. 2
Combustion Co. 8
Commonwealth Brass Corp. 17
Cooling Tower, Co., Inc. 82
Crane Co. 15

Dahlquist Mfg. Co. 105
Davis Regulator Co., G. M. 97
Detroit Lubricator Co. 16
Dole Valve Co. 18
Dunham Co., C. A. 82

Economy Pumping Machinery Co. 96
Elliott Co. 93
Excelso Specialty Works 13

Garden City Fan Co. 86
Gleockle, Jr., A. F. 103
Gorton & Lidgerwood Co. 25
Grinnell Co. 7
Griscom-Russell Co. 89
Gurney Heater Mfg. Co. 103-105

Haines & Co., Wm. S. 84
Hart & Crouse Co., ...Front Cover
Hartmann Co., Chas. 96
Healy-Ruff Co. 92
Heating & Power Appliance Co. 95
Heating Specialty Co. 91
Herbert Boiler Co. 8
Hersh Bros. Co. 76
Hill, E. Vernon Co. 85
Hoffman Specialty Co. 108
Honeywell Heating Specialty Co. 105
Hornung, J. C. 94
Hotstream Heater Co. 89
Hydro-High Vacuum Pump Co... 20

Ilg. Electric Ventilating Co. 74
Illinois Engineering Co. 22
Illinois Malleable Iron Co. 10
International Heater Co. 6

Jenkins Bros. 94
Johnson Service Co..... 32

Kennedy Valve Co. 28
Kewanee Boiler Co. 5
Knowles Mushroom Ventilator Co. 80

Marsh & Co., Jas. P. 3
Marsh Valve Co. 95
Mason Regulator Co. 98
Massachusetts Blower Co. 86
McAlear Mfg. Co. 30
Mouat-Squires Co. 24
Mueller Mfg. Co. 11

Nash Engineering Co. 72
National Asbestos Co., ... 93
National Regulator Co. 14
Nelson Corp., H. W. 23
New York Blower Co. 83

O-E Specialty Mfg. Co. 26
Oil City Boiler Works 4

Patterson-Kelley Co. 10
Peerless Engineering Co. 105
Peerless Unit Ventilator Co. 3
Porbeck Mfg. Co. 88
Powell Co., Wm. 97
Powers Regulator Co. 90

Ric-Wil Co. 92
Ross Heater & Mfg. Co. 96

Sarco Co. 22
Schaeffer & Budenberg Mfg. Co. 26-91
Seymour, James M. 88
Simmons Co., John 106
Simplex Heating Specialty Co. .. 14
Sims Co., ... 30
Skidmore Corp. 98
Skinner Bros. Mfg. Co. 107
Spencer Turbine Co. 32
Sprague Electric Works 78
Standard Thermometer Co. 91
Sterling Engineering Co. 95
Sturtevant Co., B. F. 79

Titusville Iron Works Co. 4
Trane Co. 21
Twin Fire Furnace Co. 89

Union Steam Pump Co., ... 19
Utica Heater Co. 101

Webster & Co., Warren 24
Westinghouse Elec. & Mfg. Co..... 19
Whitlock Coil Pipe Co. 12
Wing Mfg. Co., L. J. 29-84
Wright-Austin Co. 84
Wyckoff & Son Co., A. 93

Yeomans Bros. Co. 98
Young Pump Co. 97

JOHN SIMMONS CO

110 CENTRE STREET
NEW YORK

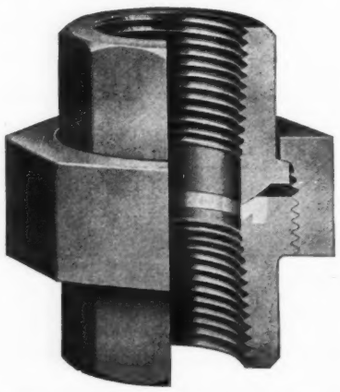
SIMMONS' MALLEABLE BRONZE SEAT UNION

The UNION You Have Been Waiting For

This UNION has a bronze metal immovable ring seat.

Corrosion and rust do not affect it.

Has no iron-to-iron contacts.



No union, regardless of weight, in actual use or test, will stand greater pressure or strain.

The joints are ball shape and ground to fit.

PERFECT CONTRACT OF ENTIRE SURFACE—NO GASKETS OR LEAD NEEDED
Designed for Working Pressures up to 250 Lbs.
EVERY UNION Tested Before Leaving Our Factory
All Sizes in Stock from 1/8" to 3" **Prices on Request**

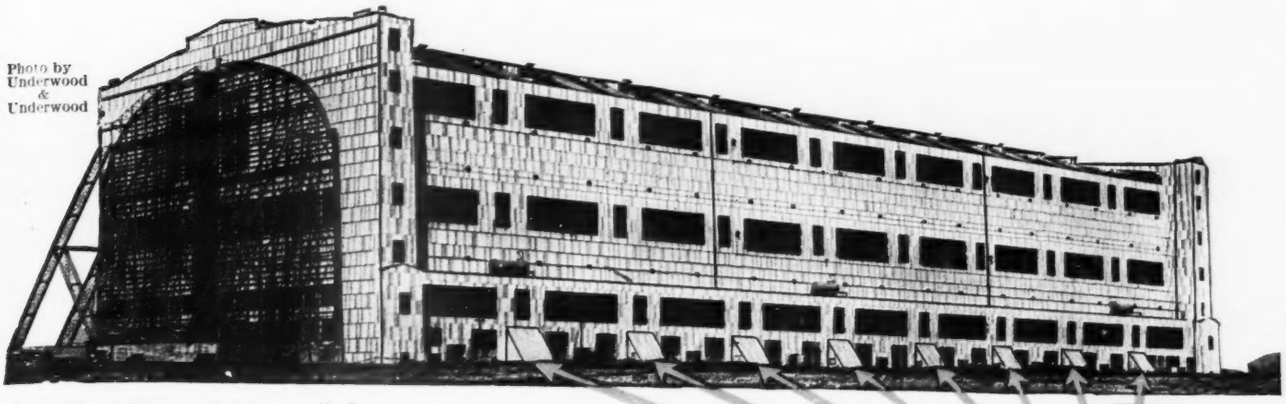


Photo by Underwood & Underwood

U. S. Naval Hangar, Lakehurst, N. J.

Heating the World's Largest Building—*Without Pipes or Ducts*

THIS enormous hangar represents a single open space with a volume of over 40,000,000 cu. ft. It is the largest open space ever enclosed by four walls and a roof and, when it was built, presented the most gigantic heating problem ever encountered.

Many thorough tests and investigations were made of different types of heating systems, with the final result that 16 Skinner Bros. (Baetz Patent) Heaters were installed in a series of specially constructed lean-tos, 8 along each side of the building. The marvel of the installation is indicated by the fact that the space occupied by all 16 heaters represents a volume of less than 6,000 cu. ft. as compared with the volume of over 40,000,000 ft. of air heated.

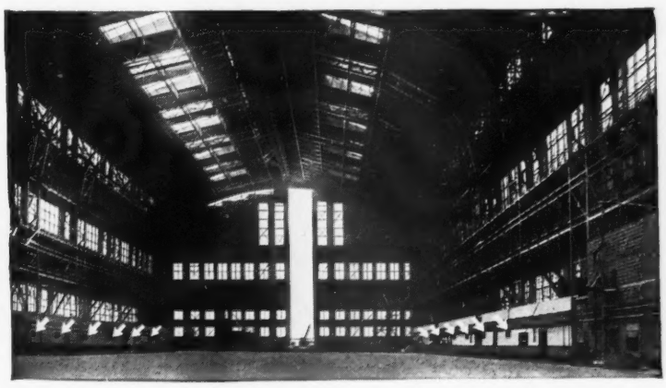


Photo by Underwood & Underwood

Illustration shows partial view of interior of the Lakehurst hangar, which is approximately 1,000 feet long, 250 feet wide and 200 feet high. Sixteen heaters heat this vast volume of air—a feat almost as remarkable as the building itself. White arrows near the floor indicate the openings through which warm air enters building from heaters installed in lean-tos outside.

Pioneers in Ductless Industrial Heating

Skinner Bros. produced the first Baetz Patent ductless heater. At that time the idea of ductless heating met with question and skepticism but the heater proved itself so conclusively that now it is in literally thousands of industrial buildings of every type and character. Repeat orders from national institutions form the best evidence of its satisfactory performance.

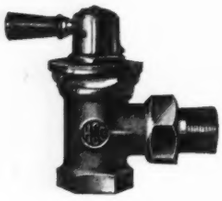
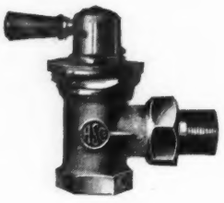
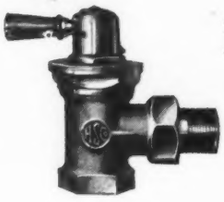
With the Skinner Bros. (Baetz Patent) Heating System no distributing pipes or ducts are used as warm air carriers, but an even, steady warmth is maintained throughout the building, and space within the heated area is kept free and unobstructed. Operates with live or exhaust steam at any pressure. Where steam is not available we supply our direct-fired type, which burns coal, coke, wood, gas or oil. Installation and operation costs are unusually low.

Every Skinner Heater is fully guaranteed when installed as directed by our engineers after a survey of the premises. Write today for full information and list of prominent users, so you can make your own investigation.

SKINNER BROS. MFG. CO., INC.
1426 So. Vandeventer Ave. St. Louis, Mo.

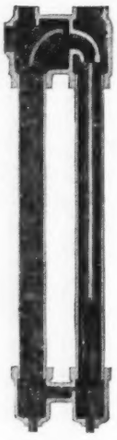
Boston, 455 Little Bldg.
Buffalo, 712 Morgan Bldg.
Chicago, 1713 Fisher Bldg.
Cincinnati, Ohio
Cleveland, 622 Marshall Bldg.
Detroit, 318 Scherer Bldg.
Kansas City, 337 Lee Bldg.
New York, 1712 Flatiron Bldg.
Pittsburgh, 8 Wood St.
San Francisco, Monadnock Block
Spokane, 419 First Ave.
Washington, D. C., 724 Evans Bldg.

Skinner Bros.
BAETZ PATENT HEATING SYSTEM

HOFFMAN
"CONTROLLED HEAT"
IS POSITIVE

The Hoffman No. 7 Adjustable Modulating Valve Accurately controls the amount of steam admitted to each radiator. It modulates.

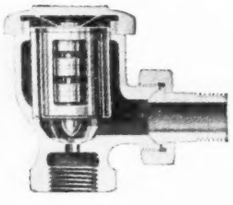
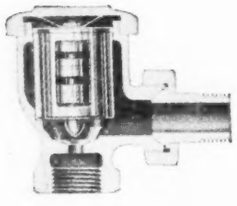
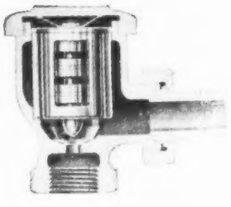


The Hoffman No. 8 Return Line Valve controls the radiator outlet, discharging all air and condensation without steam loss.

The Hoffman Differential Loop controls the boiler water line, holding it constant under all pressures. "Controlled Heat" means "Conserved Coal."

Specify these reliable positive-acting five year guaranteed specialties.

HOFFMAN SPECIALTY COMPANY

WATERBURY CONN.

Boston
New York
Philadelphia
Chicago
Minneapolis
Los Angeles